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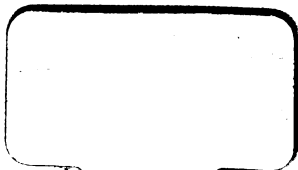
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FROM THE

UNITED STATES GOVERNMENT

THROUGH

7 Sept. 1898













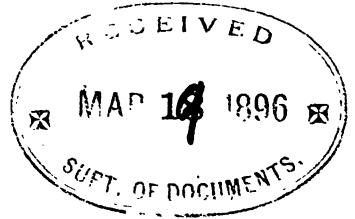




CAPE CHARLES LIGHT STATION, VIRGINIA.

ANNUAL REPORT

OF THE



LIGHT-HOUSE BOARD

TO THE

SECRETARY OF THE TREASURY

FOR THE

FISCAL YEAR ENDED JUNE 30, 1895.



WASHINGTON:

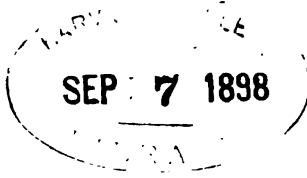
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TREASURY DEPARTMENT,

Document No. 1824.

*Office of Light-House Board.*

# LIGHT-HOUSE BOARD OF THE UNITED STATES.

Organized in conformity to the act of Congress approved August 31, 1852.

## LIST OF MEMBERS ON JUNE 30, 1895.

Hon. JOHN G. CARLISLE, Secretary of the Treasury, ex-officio president.  
Rear-Admiral JOHN G. WALKER, United States Navy, chairman.  
Col. WALTER S. FRANKLIN.  
Col. JOHN M. WILSON, Corps of Engineers, United States Army.  
Capt. GEORGE DEWEY, United States Navy.  
Maj. HENRY M. ADAMS, Corps of Engineers, United States Army.  
Gen. WILLIAM W. DUFFIELD, Superintendent of the United States Coast and Geodetic Survey.  
Commander GEORGE F. F. WILDE, United States Navy, naval secretary.  
Capt. JOHN MILLIS, Corps of Engineers, United States Army, engineer secretary.

## EXECUTIVE MEMBERS OF THE BOARD.

Rear-Admiral JOHN G. WALKER, United States Navy.  
Commander GEORGE F. F. WILDE, United States Navy.  
Capt. JOHN MILLIS, Corps of Engineers, United States Army.

## OFFICERS IN CHARGE OF LIGHT-HOUSE DISTRICTS ON JUNE 30, 1895.

### FIRST DISTRICT.

*Inspector*.—Commander GEORGE E. WINGATE, United States Navy, Portland, Me.  
*Engineer*.—Maj. WILLIAM R. LIVERMORE, Corps of Engineers, United States Army, Boston, Mass.

### SECOND DISTRICT.

*Inspector*.—Commander FRANCIS M. GREEN, United States Navy, Boston, Mass.  
*Engineer*.—Maj. WILLIAM R. LIVERMORE, Corps of Engineers, United States Army, Boston, Mass.

### THIRD DISTRICT.

*Inspector*.—Commander ALBERT S. SNOW, United States Navy, Tompkinsville, N. Y.  
*Engineer*.—Lieutenant WILLIAM E. CRAIGHILL, Corps of Engineers, United States Army, Tompkinsville, N. Y.

### FOURTH DISTRICT.

*Inspector*.—Commander GEORGE C. REITER, United States Navy, Philadelphia, Pa.  
*Engineer*.—Maj. CHARLES W. RAYMOND, Corps of Engineers, United States Army, Philadelphia, Pa.

### FIFTH DISTRICT.

*Inspector*.—Commander BENJAMIN P. LAMBERTON, United States Navy, Baltimore, Md.  
*Engineer*.—Capt. ERIC BERGLAND, Corps of Engineers, United States Army, Baltimore, Md.





## PERSONNEL.

The following changes have taken place in the personnel of the Light-House Board since the date of the last annual report:

1. On August 16, 1894, Capt. ROBLEY D. EVANS, United States Navy, naval secretary, was succeeded by Commander GEORGE F. F. WILDE, United States Navy.

2. On September 4, 1894, Capt. PHILIP M. PRICE, Corps of Engineers, United States Army, engineer secretary, died suddenly, and on October 12, 1894, was succeeded by Capt. JOHN MILLIS, Corps of Engineers, United States Army.

3. On October 27, 1894, Prof. THOMAS C. MENDENHALL was succeeded by Gen. WILLIAM W. DUFFIELD.

4. On December 1, 1894, Rear-Admiral JAMES A. GREER, United States Navy, chairman, was succeeded by Rear-Admiral JOHN G. WALKER, United States Navy.

The following-named changes in the personnel of the district officers took place during the fiscal year:

## THIRD DISTRICT.

*Inspector.*—Capt. WINFIELD S. SCHLEY, United States Navy, to March 1, 1895; Commander ALBERT S. SNOW, United States Navy, Tompkinsville, N. Y., from March 1, 1895.

*Engineer.*—Maj. DAVID P. HEAP, Corps of Engineers, United States Army, to October 31, 1894; Lieut. Col. PETER C. HAINS, Corps of Engineers, United States Army, from November 12, 1894, to May 23, 1895; Lieut. WILLIAM E. CRAIGHILL, Corps of Engineers, United States Army, Tompkinsville, N. Y., from May 23, 1895.

## FIFTH DISTRICT.

*Inspector.*—Commander YATES STIRLING, United States Navy, to October 1, 1894; Commander BENJAMIN P. LAMBERTON, United States Navy, Baltimore, Md., from October 1, 1894.

## TENTH DISTRICT.

*Inspector.*—Commander JAMES G. GREEN, United States Navy, to August 15, 1894; Commander CHARLES V. GRIDLEY, United States Navy, Buffalo, N. Y., from August 15, 1894.

## FOURTEENTH DISTRICT.

*Inspector.*—Lieut. Commander F. W. CROCKER, United States Navy, to March 15, 1895; Lieut. Commander WILLIAM W. GILLPATRICK, United States Navy, Cincinnati, Ohio, from March 15, 1895.







# R E P O R T

## OF

### THE UNITED STATES LIGHT-HOUSE BOARD.

TREASURY DEPARTMENT,  
OFFICE OF THE LIGHT-HOUSE BOARD,  
*Washington, D. C., November 9, 1895.*

SIR: The Light-House Board has the honor to submit, for your information and that of Congress, the following report of the work done under its direction during the fiscal year which ended on June 30, 1895.

At the close of the year there were under the control of the Light-House Establishment the following-named aids to navigation:

Light-houses and beacon lights .....	1, 014
Light-ships in position .....	41
Light-ships for relief .....	4
Electric-lighted buoys in position .....	11
Gas buoys in position .....	12
Fog signals operated by steam or caloric engines .....	130
Fog signals operated by clockwork .....	185
Post lights on the Western rivers .....	1, 411
Post lights on other rivers .....	382
Day or unlighted beacons .....	424
Whistling buoys in position .....	66
Bell buoys in position .....	96
Other buoys in position, including pile buoys and stakes in Fifth district and buoys in Alaskan waters .....	4, 547

In the construction, care, and maintenance of these aids to navigation there were employed—

Steam tenders .....	32
Steam launches .....	4
Sailing tenders .....	2
Light keepers .....	1, 203
Other employees, including crews of light-ships and tenders .....	1, 078
Laborers in charge of Western river lights .....	1, 154
Laborers in charge of other river post lights .....	210

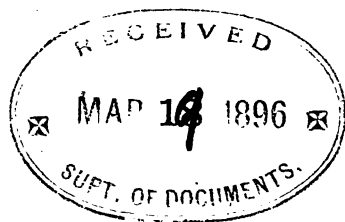


CAPE CHARLES LIGHT STATION, VIRGINIA.

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ANNUAL REPORT

OF THE



LIGHT-HOUSE BOARD

TO THE

SECRETARY OF THE TREASURY

FOR THE

FISCAL YEAR ENDED JUNE 30, 1895.



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1895.

*Barlow Point range (rear) post light, Columbia River, Washington.*—A tubular-lantern light, February 8, 1895.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Two lens-lantern lights, March 6, 1895.

*Yaquina Bar range beacons, entrance to Yaquina Bay, Oregon.*—A lens-lantern and a tubular-lantern light, March 7, 1895.

*Government Wharf beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.

*Middle Ground beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.

*Grassy Island Ledge beacon, Woods Hole, Massachusetts.*—A lens-lantern light, March 31, 1895.

*Middle Ledge beacon, Woods Hole, Massachusetts.*—A double lens-lantern light, March 31, 1895.

*Manhattan range, Maumee Bay, Ohio.*—Two sixth-order lights, April 1, 1895.

*South Boston range, Boston Harbor, Massachusetts.*—A double and a single lens-lantern light, April 15, 1895.

*Mandarin Point post light, St. Johns River, Florida.*—A lantern light, May 10, 1895.

*Muskegon Lake beacon, Lake Michigan, Michigan.*—A lantern light, May 10, 1895.

*St. Simon range (front), entrance to St. Simon Sound, Georgia.*—A reflector light, May 15, 1895.

*Carrabelle River Bar range beacons, St. George Sound, Florida.*—Two lantern lights, May 25, 1895.

*Timber Island beacon, Carrabelle River, Florida.*—A lantern light, May 25, 1895.

*Sitka Harbor, Alaska.*—A tubular-lantern light, June 20, 1895.

#### NEW FOG SIGNALS.

During the fiscal year fog signals were established at the following-named existing light-stations:

*Hudson City, Hudson River, New York.*—A bell struck by machinery, July 15, 1894.

*Wolf Trap, Chesapeake Bay, Virginia.*—A bell struck by hand, September 20, 1894.

*Ludington Pierhead range, Lake Michigan, Michigan.*—A 10-inch steam whistle, January 31, 1895.

*Kewaunee Pierhead, Lake Michigan, Wisconsin.*—A 10-inch steam whistle, January 31, 1895.

*Smith Point light-vessel, No. 46, Chesapeake Bay, Virginia.*—A 12-inch steam whistle, June 8, 1895.

During the fiscal year an auxiliary fog signal was established at the following-named fog-signal station:

*Cuckolds, off the entrance to Boothbay, Maine.*—A 1,000-pound bell, April 15, 1895.



The following-named new fog signals were established during the fiscal year:

*Boston light-vessel, No. 54, off the entrance to Boston Harbor, Massachusetts.*—A 12-inch steam chime whistle, October 1, 1894.

*Fourteen-Mile Point Lake Superior, Michigan.*—A 10-inch steam whistle, October 15, 1894.

#### LIGHTS DISCONTINUED.

The following-named lights were, in the course of the last fiscal year, discontinued:

*Oak Island range, entrance to Cape Fear River, North Carolina.*—A tubular-lantern and a fourth-order light, July 31, 1894.

*Shaws Island post light, Grand Lake, Louisiana.*—A tubular-lantern light, August 8, 1894.

*Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A reflector light, August 15, 1894.

*Mid-Channel post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Martin Island range post lights, Columbia River, Washington.*—Two tubular-lantern lights, September 8, 1894.

*Wolf Trap Shoal light-vessel, No. 46, Chesapeake Bay, Virginia.*—Two reflector lights, September 20, 1894.

*Marquette Breakwater, Lake Superior, Michigan.*—A lantern light, October 1, 1894.

*Bristol Ferry, Mount Hope Bay, Rhode Island.*—A sixth-order light, October 30, 1894. (Reestablished November 5, 1894.)

*Sands Point, Long Island Sound, New York.*—A fourth-order light, October 31, 1894. (Reestablished January 21, 1895.)

*Kecaunee Pierhead range (front), Lake Michigan, Wisconsin.*—A tubular-lantern light, November 2, 1894.

*Rock Island, St. Lawrence River, New York.*—A reflector light, close of navigation, 1894.

*Twelve-Mile Point post light, Mississippi River, Louisiana.*—A tubular-lantern light, December 31, 1894.

*Jones Point post light, No. 6, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Eau Gallie post light, No. 12, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Grant Farm (upper) post light, No. 9 $\frac{3}{4}$ , Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Peck Lake, North, post light, No. 26, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Peck Lake, South, post light, No. 28, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*South Narrows post light, No. 32, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

- Execution Rocks, Long Island Sound, New York.*—The easterly edge of the red sector was corrected December 8, 1894, to bear NE.  $\frac{1}{4}$  N. and guide clear of the south end of Hart Island.
- Coon Island post light, entrance to the Willamette River, Oregon.*—Changed December 18, 1894, from red to white.
- Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from light-vessel No. 20, temporarily marking the station, to light-vessel No. 48; characteristic changed to two reflector lights, the one on the foremast showing a white flash every 30 seconds, and that on the mainmast showing fixed red; height decreased from 54 feet to 37 feet, January 15, 1895.
- Muskegon Pierhead, Lake Michigan, Michigan.*—Changed, January 16, 1895, to illuminate the entire horizon.
- Grant Farm (lower) post light, Indian River, Florida.*—Changed from white to red, the color of its day mark from black to red, and its number to 14 $\frac{1}{2}$ , January 31, 1895.
- Port Penn range (front), Delaware River, Delaware.*—Changed February 14, 1895, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Wolf Trap, Chesapeake Bay, Virginia.*—Changed February 28, 1895, from fixed white varied by a white flash every 10 seconds, to fixed white varied by a white flash every 25 seconds.
- Cubits Gap post light, Mississippi River, Louisiana.*—Changed from fixed white to fixed red, March 1, 1895.
- Waackaack, New York Bay, New Jersey.*—Changed by the substitution of a third-order for the first-order lamp in each of the two range lenses, April 18, 1895.
- Sand Spit, Hudson River, New York.*—Exhibited from a new structure, a dolphin of five piles, May 2, 1895.
- Ahnapee Pierhead range (rear), Lake Michigan, Wisconsin.*—Changed, June 6, 1895, from a lens-lantern to a fifth-order light.
- Smith Point light-vessel, Chesapeake Bay, Virginia.*—Changed, June 8, 1895, from the schooner *Drift* to light-vessel No. 46, from two lens-lantern to two reflector lights, and from 57 to 45 feet in height.
- Yaquina Bar range (rear) beacon, Yaquina Bay, Oregon.*—Height increased to 30 $\frac{1}{4}$  feet, June 18, 1895.
- Mahon River, Delaware Bay, Delaware.*—Changed, June 29, 1895, from fixed white to fixed white with a narrow fixed red sector between S. 26° 15' W. (SSW.  $\frac{3}{4}$  W.) and S. 31° 25' W. (SSW.  $\frac{1}{2}$  W.).

## CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in fog signals:

- North Hook beacon, Sandy Hook, New Jersey.*—The characteristic of the siren was changed, November 30, 1894, to sound blasts of 3 seconds, separated by silent intervals of 27 seconds' duration.

- Barlow Point post light, Columbia River, Washington.*—Changed September 8, 1894, from a cluster of piles to an arm on a tree.
- La Du post light, Columbia River, Washington.*—Changed from fixed red to fixed white, September 8, 1894.
- St. Helens Jetty post light, Columbia River, Washington.*—Changed from fixed red to fixed white, and from a framework to a gallows frame, September 8, 1894.
- Cherry Island range (front), Delaware River, Delaware.*—Changed September 20, 1894, from fixed to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Waackaack (main channel range, rear), New York Bay, New Jersey.*—Changed to a new structure, height increased from 76 to 101½ feet, and luminous intensity increased by changing to a second-order range lens, October 25, 1894.
- Finns. Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- New Castle range (front) Delaware River, Delaware.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Deep Water Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Schooner Ledge range (front), Delaware River, Pennsylvania.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Billingsport range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Rock Island, St. Lawrence River, New York.*—Height increased to 45 feet in October, 1894.
- Beacon 1 post light, Columbia River, Oregon.*—Changed December 1, 1894, from red to white.
- Sandy Hook light-vessel, entrance to New York Bay, New York.*—Changed from light-vessel No. 48 to light-vessel No. 51; characteristic changed from one flashing red and one fixed red reflector light to one fixed white electric light, shown simultaneously from a group of four lens lanterns, during periods of 12 seconds' duration separated by an eclipse of 3 seconds' duration; height increased from 37 feet to 54 feet, December 5, 1894.
- Scotland light-vessel, No. 7, entrance to New York Bay, New Jersey.*—Changed December 5, 1894, from two fixed white to two fixed red lights.
- Ram Island Reef light-vessel, Fishers Island Sound, New York.*—Changed December 8, 1894, from light-vessel No. 19 to light-vessel No. 23, having a red instead of a straw-colored hull, and black instead of red day marks at the mastheads.

*Execution Rocks, Long Island Sound, New York.*—The easterly edge of the red sector was corrected December 8, 1894, to bear NE.  $\frac{1}{4}$  N. and guide clear of the south end of Hart Island.

*Coon Island post light, entrance to the Willamette River, Oregon.*—Changed December 18, 1894, from red to white.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from light-vessel No. 20, temporarily marking the station, to light-vessel No. 48; characteristic changed to two reflector lights, the one on the foremast showing a white flash every 30 seconds, and that on the mainmast showing fixed red; height decreased from 54 feet to 37 feet, January 15, 1895.

*Muskegon Pierhead, Lake Michigan, Michigan.*—Changed, January 16, 1895, to illuminate the entire horizon.

*Grant Farm (lower) post light, Indian River, Florida.*—Changed from white to red, the color of its day mark from black to red, and its number to 14 $\frac{1}{2}$ , January 31, 1895.

*Port Penn range (front), Delaware River, Delaware.*—Changed February 14, 1895, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed February 28, 1895, from fixed white varied by a white flash every 10 seconds, to fixed white varied by a white flash every 25 seconds.

*Cubits Gap post light, Mississippi River, Louisiana.*—Changed from fixed white to fixed red, March 1, 1895.

*Waackaack, New York Bay, New Jersey.*—Changed by the substitution of a third-order for the first-order lamp in each of the two range lenses, April 18, 1895.

*Sand Spit, Hudson River, New York.*—Exhibited from a new structure, a dolphin of five piles, May 2, 1895.

*Ahnapee Pierhead range (rear), Lake Michigan, Wisconsin.*—Changed, June 6, 1895, from a lens-lantern to a fifth-order light.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Changed, June 8, 1895, from the schooner *Drift* to light-vessel No. 46, from two lens-lantern to two reflector lights, and from 57 to 45 feet in height.

*Yaquina Bar range (rear) beacon, Yaquina Bay, Oregon.*—Height increased to 30 $\frac{1}{4}$  feet, June 18, 1895.

*Mahon River, Delaware Bay, Delaware.*—Changed, June 29, 1895, from fixed white to fixed white with a narrow fixed red sector between S. 26° 15' W. (SSW.  $\frac{3}{4}$  W.) and S. 31° 25' W. (SSW.  $\frac{1}{4}$  W.).

#### CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in fog signals:

*North Hook beacon, Sandy Hook, New Jersey.*—The characteristic of the siren was changed, November 30, 1894, to sound blasts of 3 seconds, separated by silent intervals of 27 seconds' duration.

*Sandy Hook light-vessel, entrance to New York Bay, New York.*—The 12-inch steam whistle was changed, December 5, 1894, to sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed, January 7, 1895, from a bell struck by hand to a Daboll trumpet sounding blasts of 3 seconds' duration, separated by silent intervals of 7 seconds.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from a 12-inch to a 10-inch steam whistle, and from blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, to blasts of 3 seconds' duration, separated by alternate silent intervals of 1 second and 30 seconds, January 15, 1895.

*St. George Reef, off the seacoast of California.*—Changed, March 1, 1895, to sound blasts of 5 seconds' duration, separated by silent intervals of 75 seconds.

*Fort Gratiot, Lake Huron, Michigan.*—Changed, April 8, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 17 seconds.

*Buffalo Breakwater (north end), Lake Erie, New York.*—Changed, June 1, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 57 seconds.

*Avery Rock, Machias Bay, Maine.*—Changed, June 20, 1895, from a blow every 11 seconds to a blow every 10 seconds.

*Pond Island, mouth of the Kennebec River, Maine.*—Changed, June 20, 1895, from a blow every  $8\frac{1}{2}$  seconds to a blow every 10 seconds.

#### CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

*Grand Haven Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 6, 1894, 278 feet nearer the outer end of the south pier.

*New Channel range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 320 feet NNW.  $\frac{1}{8}$  W., from its former position.

*New Channel range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 350 feet NNW.  $\frac{1}{4}$  W., from its former position.

*Smith Island range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 1,600 feet W.  $\frac{5}{8}$  N. from its former position.

*Smith Island range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 2,100 feet NW.  $\frac{1}{8}$  W. from its former position.

*Muskegon Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 20, 1894, 323 feet nearer the outer end of the south pier.

- Cape Canaveral light, seacoast of Florida.*—Moved, July 25, 1894, 5,200 feet S.  $87^{\circ} 24'$  W. (W.  $\frac{1}{4}$  S.) from its former position.
- Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Moved, July 26, 1894, a little to the southward and westward.
- Northeast End light-vessel No. 44, off the seacoast of New Jersey.*—Moved, September 1, 1894, about 2 miles E.  $\frac{1}{2}$  S. from her former moorings.
- Five-Fathom Bank light-vessel No. 40, off the seacoast of New Jersey.*—Moved, September 1, 1894, about  $1\frac{1}{2}$  miles SE. by S. from her former moorings.
- Barlow Point post light, Columbia River, Washington.*—Moved, September 8, 1894, about 1,400 feet WNW. from its former position.
- Scotch Cap post light, Thames River, Connecticut.*—Moved, September 10, 1894, from the west bank of the river S. by E. to a location in 6 feet of water.
- Marquette Breakwater light, Lake Superior, Michigan.*—Moved, October 1, 1894, about 1,000 feet to the outer end of the extended breakwater.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 7, 1894, northwesterly, along the range line, 20 feet from its former position.
- Waackaack (main channel range, rear) light, New York Bay, New Jersey.*—Moved, October 25, 1894, 52 feet westerly, along the main channel range, to the position occupied previous to November, 1892.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 29, 1894, northwesterly, along the range line, 20 feet from its former position.
- Fort Mifflin fog signal, Delaware River, Pennsylvania.*—Moved, November 19, 1894, from the dock to the parapet back of the dock at Fort Mifflin.
- Kewaunee Pierhead range (rear) light, Lake Michigan, Wisconsin.*—Moved November 2, 1894, 300 feet nearer the outer end of the north pier.
- Winter Point range (rear) light, St. Marys River, Michigan.*—Moved, November 3, 1894, to a point on the westerly prolongation of the range line 675 feet in rear of the front light.
- Twin River Point light, Lake Michigan, Wisconsin.*—Moved November 19, 1894, to a new tower, located 47 feet S.  $68^{\circ} 30'$  W. (WSW.  $\frac{1}{2}$  W.) from the former tower.
- Salisbury Beach range lights, entrance to Newburyport Harbor, Massachusetts.*—Moved, November 20, 1894, about one-fourth mile NNE. from their former location, to mark the line of best water across the bar.

*Beacon 1 post light, Columbia River, Oregon.*—Moved, December 1, 1894, into 14 feet of water about five-eighths mile westerly from its former position.

*South Pass light-vessel, No. 43, off South Pass, entrance to the Mississippi River, Louisiana.*—Moved, December 3, 1894, into 82 feet of water about 1 mile NE. from her former moorings.

*Cubits Gap post light, Mississippi River, Louisiana.*—Moved, January 1, 1895, about one-third mile up the river and exhibited from the fog-bell tower at a height of 35 feet.

*Smith Point post light, Columbia River, Oregon.*—Moved, January 1, 1895, to a stake on the railway trestle off the point.

*Micco post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure about 1 mile to the southward and eastward of Grant Farm.

*St. Lucie post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure nearly five-eighths mile W.  $\frac{1}{2}$  N. from its former location.

*North Narrows post light, Indian River, Florida.*—Moved, January 31, 1895, about three-eighths mile NNW. of its former location.

*Barlow Point range (front) post light, Columbia River, Washington.*—Moved, February 8, 1895, to a new structure.

*Fairport Pierhead range (front) light, Lake Erie, Ohio.*—Moved, February 1, 1895, 122 feet to the southward of its former location.

*Grosse Isle South Channel range lights, Detroit River, Michigan.*—On March 30, 1895, the front and rear lights of this range were reestablished, each in a new structure, and the heights changed, respectively, to 30 feet and 50 feet above the level of the river.

*Lake Huron light-vessel, No. 61, off the entrance to the St. Clair River, Michigan.*—Moved, on the opening of navigation 1895, to a position 9,125 feet N.  $19^{\circ} 53'$  E. (N.  $\frac{3}{4}$  E.) from Fort Gratiot light-house.

*Grand Haven Pierhead light, Lake Michigan, Michigan.*—Moved, May 4, 1895, 511 feet nearer the outer end of the south pier.

#### NEW BUOYS.

During the fiscal year the following-named special buoys were established:

*Trinity Shoal, Gulf coast of Louisiana.*—A bell buoy, August 15, 1894.

*Lloyd Point, Shoal, off Lloyd Neck, Long Island Sound, New York.*—A bell buoy, September 13, 1894.

*Sewell Point, Hampton Roads, Virginia.*—A bell buoy, September 19, 1894.

*Baker Shoal, Delaware River, New Jersey.*—A gas-lighted buoy, September 29, 1894.

*Bishop Rock Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, October 19, 1894.

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Staniford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Breakwater light-station.

## BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

## TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.



- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (iron) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.

- Barlow Point range (rear) post light, Columbia River, Washington.*—A tubular-lantern light, February 8, 1895.
- Smith Point light-vessel, Chesapeake Bay, Virginia.*—Two lens-lantern lights, March 6, 1895.
- Yaquina Bar range beacons, entrance to Yaquina Bay, Oregon.*—A lens-lantern and a tubular-lantern light, March 7, 1895.
- Government Wharf beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.
- Middle Ground beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.
- Grassy Island Ledge beacon, Woods Hole, Massachusetts.*—A lens-lantern light, March 31, 1895.
- Middle Ledge beacon, Woods Hole, Massachusetts.*—A double lens-lantern light, March 31, 1895.
- Manhattan range, Maumee Bay, Ohio.*—Two sixth-order lights, April 1, 1895.
- South Boston range, Boston Harbor, Massachusetts.*—A double and a single lens-lantern light, April 15, 1895.
- Mandarin Point post light, St. Johns River, Florida.*—A lantern light, May 10, 1895.
- Muskegon Lake beacon, Lake Michigan, Michigan.*—A lantern light, May 10, 1895.
- St. Simon range (front), entrance to St. Simon Sound, Georgia.*—A reflector light, May 15, 1895.
- Carrabelle River Bar range beacons, St. George Sound, Florida.*—Two lantern lights, May 25, 1895.
- Timber Island beacon, Carrabelle River, Florida.*—A lantern light, May 25, 1895.
- Sitka Harbor, Alaska.*—A tubular-lantern light, June 20, 1895.

#### NEW FOG SIGNALS.

During the fiscal year fog signals were established at the following-named existing light-stations:

- Hudson City, Hudson River, New York.*—A bell struck by machinery, July 15, 1894.
- Wolf Trap, Chesapeake Bay, Virginia.*—A bell struck by hand, September 20, 1894.
- Ludington Pierhead range, Lake Michigan, Michigan.*—A 10-inch steam whistle, January 31, 1895.
- Kewaunee Pierhead, Lake Michigan, Wisconsin.*—A 10-inch steam whistle, January 31, 1895.
- Smith Point light-vessel, No. 46, Chesapeake Bay, Virginia.*—A 12-inch steam whistle, June 8, 1895.

During the fiscal year an auxiliary fog signal was established at the following-named fog-signal station:

- Cuckolds, off the entrance to Boothbay, Maine.*—A 1,000-pound bell, April 15, 1895.

The following-named new fog signals were established during the fiscal year:

*Boston light-vessel, No. 54, off the entrance to Boston Harbor, Massachusetts.*—A 12-inch steam chime whistle, October 1, 1894.

*Fourteen-Mile Point Lake Superior, Michigan.*—A 10-inch steam whistle, October 15, 1894.

#### LIGHTS DISCONTINUED.

The following-named lights were, in the course of the last fiscal year, discontinued:

*Oak Island range, entrance to Cape Fear River, North Carolina.*—A tubular-lantern and a fourth-order light, July 31, 1894.

*Shaws Island post light, Grand Lake, Louisiana.*—A tubular-lantern light, August 8, 1894.

*Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A reflector light, August 15, 1894.

*Mid-Channel post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Martin Island range post lights, Columbia River, Washington.*—Two tubular-lantern lights, September 8, 1894.

*Wolf Trap Shoal light-vessel, No. 46, Chesapeake Bay, Virginia.*—Two reflector lights, September 20, 1894.

*Marquette Breakwater, Lake Superior, Michigan.*—A lantern light, October 1, 1894.

*Bristol Ferry, Mount Hope Bay, Rhode Island.*—A sixth-order light, October 30, 1894. (Reestablished November 5, 1894.)

*Sands Point, Long Island Sound, New York.*—A fourth-order light, October 31, 1894. (Reestablished January 21, 1895.)

*Kecaunee Pierhead range (front), Lake Michigan, Wisconsin.*—A tubular-lantern light, November 2, 1894.

*Rock Island, St. Lawrence River, New York.*—A reflector light, close of navigation, 1894.

*Twelve-Mile Point post light, Mississippi River, Louisiana.*—A tubular-lantern light, December 31, 1894.

*Jones Point post light, No. 6, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Eau Gallie post light, No. 12, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Grant Farm (upper) post light, No. 9 $\frac{3}{4}$ , Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Peck Lake, North, post light, No. 26, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Peck Lake, South, post light, No. 28, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*South Narrows post light, No. 32, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

- Conch Bar post light, No. 36, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.
- Solomons Lump, Chesapeake Bay, Maryland.*—A lens-lantern light, February 22, 1895. (Wreck of structure carried away by ice.)
- Venus Point range (front), entrance to Savannah River, South Carolina.*—A reflector light, March 18, 1895.
- Maumee outer range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Maumee middle range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Maumee inner range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—A lantern light, May 4, 1895.
- Orange Park post light, No. 38, St. Johns River, Florida.*—A tubular-lantern light, May 10, 1895.

#### FOG SIGNAL DISCONTINUED.

During the fiscal year the following-named fog signal was discontinued:

- Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A 12-inch steam whistle, August 15, 1894.

#### CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

- Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—Changed July 6, 1894, from a tubular-lantern to a lantern light.
- New Channel range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from tubular-lantern to lens-lantern lights. Height of front and rear lights increased, respectively, to 20 feet and 38 feet.
- Smith Island range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from lens-lantern to lantern lights. Height of front and rear lights increased, respectively, 2 feet and 3 feet.
- Maumee Bay ranges, Maumee Bay, Ohio.*—Luminous intensity of lights increased July 20, 1894, by changing the front and east lights from reflector to lens-lantern lights, and the west light from a reflector to a lantern light.
- Muskegon Pierhead range (front), Lake Michigan, Michigan.*—Changed July 21, 1894, from a tubular-lantern light to a lantern light.
- Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Changed from light-vessel No. 54 to light-vessel No. 58, July 26, 1894.

- Barlow Point post light, Columbia River, Washington.*—Changed September 8, 1894, from a cluster of piles to an arm on a tree.
- La Du post light, Columbia River, Washington.*—Changed from fixed red to fixed white, September 8, 1894.
- St. Helens Jetty post light, Columbia River, Washington.*—Changed from fixed red to fixed white, and from a framework to a gallows frame, September 8, 1894.
- Cherry Island range (front), Delaware River, Delaware.*—Changed September 20, 1894, from fixed to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Waackaack (main channel range, rear), New York Bay, New Jersey.*—Changed to a new structure, height increased from 76 to 101½ feet, and luminous intensity increased by changing to a second-order range lens, October 25, 1894.
- Finns. Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- New Castle range (front) Delaware River, Delaware.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Deep Water Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Schooner Ledge range (front), Delaware River, Pennsylvania.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Billingsport range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Rock Island, St. Lawrence River, New York.*—Height increased to 45 feet in October, 1894.
- Beacon 1 post light, Columbia River, Oregon.*—Changed December 1, 1894, from red to white.
- Sandy Hook light-vessel, entrance to New York Bay, New York.*—Changed from light-vessel No. 48 to light-vessel No. 51; characteristic changed from one flashing red and one fixed red reflector light to one fixed white electric light, shown simultaneously from a group of four lens lanterns, during periods of 12 seconds' duration separated by an eclipse of 3 seconds' duration; height increased from 37 feet to 54 feet, December 5, 1894.
- Scotland light-vessel, No. 7, entrance to New York Bay, New Jersey.*—Changed December 5, 1894, from two fixed white to two fixed red lights.
- Ram Island Reef light-vessel, Fishers Island Sound, New York.*—Changed December 8, 1894, from light-vessel No. 19 to light-vessel No. 23, having a red instead of a straw-colored hull, and black instead of red day marks at the mastheads.

*Execution Rocks, Long Island Sound, New York.*—The easterly edge of the red sector was corrected December 8, 1894, to bear NE.  $\frac{1}{4}$  N. and guide clear of the south end of Hart Island.

*Coon Island post light, entrance to the Willamette River, Oregon.*—Changed December 18, 1894, from red to white.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from light-vessel No. 20, temporarily marking the station, to light-vessel No. 48; characteristic changed to two reflector lights, the one on the foremast showing a white flash every 30 seconds, and that on the mainmast showing fixed red; height decreased from 54 feet to 37 feet, January 15, 1895.

*Muskegon Pierhead, Lake Michigan, Michigan.*—Changed, January 16, 1895, to illuminate the entire horizon.

*Grant Farm (lower) post light, Indian River, Florida.*—Changed from white to red, the color of its day mark from black to red, and its number to 14 $\frac{1}{2}$ , January 31, 1895.

*Port Penn range (front), Delaware River, Delaware.*—Changed February 14, 1895, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed February 28, 1895, from fixed white varied by a white flash every 10 seconds, to fixed white varied by a white flash every 25 seconds.

*Cubits Gap post light, Mississippi River, Louisiana.*—Changed from fixed white to fixed red, March 1, 1895.

*Waackaack, New York Bay, New Jersey.*—Changed by the substitution of a third-order for the first-order lamp in each of the two range lenses, April 18, 1895.

*Sand Spit, Hudson River, New York.*—Exhibited from a new structure, a dolphin of five piles, May 2, 1895.

*Ahnapee Pierhead range (rear), Lake Michigan, Wisconsin.*—Changed, June 6, 1895, from a lens-lantern to a fifth-order light.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Changed, June 8, 1895, from the schooner *Drift* to light-vessel No. 46, from two lens-lantern to two reflector lights, and from 57 to 45 feet in height.

*Yaquina Bar range (rear) beacon, Yaquina Bay, Oregon.*—Height increased to 30 $\frac{1}{4}$  feet, June 18, 1895.

*Mahon River, Delaware Bay, Delaware.*—Changed, June 29, 1895, from fixed white to fixed white with a narrow fixed red sector between S. 26° 15' W. (SSW.  $\frac{3}{4}$  W.) and S. 31° 25' W. (SSW.  $\frac{3}{4}$  W.).

#### CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in fog signals:

*North Hook beacon, Sandy Hook, New Jersey.*—The characteristic of the siren was changed, November 30, 1894, to sound blasts of 3 seconds, separated by silent intervals of 27 seconds' duration.

*Sandy Hook light-vessel, entrance to New York Bay, New York.*—The 12-inch steam whistle was changed, December 5, 1894, to sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed, January 7, 1895, from a bell struck by hand to a Daboll trumpet sounding blasts of 3 seconds' duration, separated by silent intervals of 7 seconds.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from a 12-inch to a 10-inch steam whistle, and from blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, to blasts of 3 seconds' duration, separated by alternate silent intervals of 1 second and 30 seconds, January 15, 1895.

*St. George Reef, off the seacoast of California.*—Changed, March 1, 1895, to sound blasts of 5 seconds' duration, separated by silent intervals of 75 seconds.

*Fort Gratiot, Lake Huron, Michigan.*—Changed, April 8, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 17 seconds.

*Buffalo Breakwater (north end), Lake Erie, New York.*—Changed, June 1, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 57 seconds.

*Avery Rock, Machias Bay, Maine.*—Changed, June 20, 1895, from a blow every 11 seconds to a blow every 10 seconds.

*Pond Island, mouth of the Kennebec River, Maine.*—Changed, June 20, 1895, from a blow every  $8\frac{1}{2}$  seconds to a blow every 10 seconds.

#### CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

*Grand Haven Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 6, 1894, 278 feet nearer the outer end of the south pier.

*New Channel range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 320 feet NNW.  $\frac{3}{16}$  W., from its former position.

*New Channel range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 350 feet NNW.  $\frac{1}{4}$  W., from its former position.

*Smith Island range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 1,600 feet W.  $\frac{5}{8}$  N. from its former position.

*Smith Island range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 2,100 feet NW.  $\frac{1}{8}$  W. from its former position.

*Muskegon Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 20, 1894, 323 feet nearer the outer end of the south pier.

- off Cape Canaveral light, seacoast of Florida.*—Moved, July 25, 1894, 5,200 feet N. N. E.  $2\frac{1}{2}$  W. W.  $\frac{1}{2}$  S.) from its former position.
- New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Moved, July 26, 1894, a little to the southward and westward.
- North-east End light-vessel No. 44, off the seacoast of New Jersey.*—Moved, September 1, 1894, about 2 miles E.  $\frac{1}{2}$  S. from her former moorings.
- Five Fathom Bank light-vessel No. 40, off the seacoast of New Jersey.*—Moved, September 1, 1894, about  $1\frac{1}{2}$  miles SE. by S. from her former moorings.
- Harlow Point post light, Columbia River, Washington.*—Moved, September 8, 1894, about 1,400 feet WNW. from its former position.
- Scotch Cap post light, Thames River, Connecticut.*—Moved, September 10, 1894, from the west bank of the river S. by E. to a location in 6 feet of water.
- Marquette Breakwater light, Lake Superior, Michigan.*—Moved, October 1, 1894, about 1,000 feet to the outer end of the extended breakwater.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 7, 1894, northwesterly, along the range line, 20 feet from its former position.
- Waackaack (main channel range, rear) light, New York Bay, New Jersey.*—Moved, October 25, 1894, 52 feet westerly, along the main channel range, to the position occupied previous to November, 1892.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 29, 1894, northwesterly, along the range line, 20 feet from its former position.
- Fort Mifflin fog signal, Delaware River, Pennsylvania.*—Moved, November 19, 1894, from the dock to the parapet back of the dock at Fort Mifflin.
- Kewaunee Pierhead range (rear) light, Lake Michigan, Wisconsin.*—Moved November 2, 1894, 300 feet nearer the outer end of the north pier.
- Winter Point range (rear) light, St. Marys River, Michigan.*—Moved, November 3, 1894, to a point on the westerly prolongation of the range line 675 feet in rear of the front light.
- Twin River Point light, Lake Michigan, Wisconsin.*—Moved November 19, 1894, to a new tower, located 47 feet S.  $68^{\circ} 30'$  W. (WSW.  $\frac{1}{2}$  W.) from the former tower.
- Salisbury Beach range lights, entrance to Newburyport Harbor, Massachusetts.*—Moved, November 20, 1894, about one-fourth mile NNE. from their former location, to mark the line of best water across the bar.



*Beacon 1 post light, Columbia River, Oregon.*—Moved, December 1, 1894, into 14 feet of water about five-eighths mile westerly from its former position.

*South Pass light-vessel, No. 43, off South Pass, entrance to the Mississippi River, Louisiana.*—Moved, December 3, 1894, into 82 feet of water about 1 mile NE. from her former moorings.

*Cubits Gap post light, Mississippi River, Louisiana.*—Moved, January 1, 1895, about one-third mile up the river and exhibited from the fog-bell tower at a height of 35 feet.

*Smith Point post light, Columbia River, Oregon.*—Moved, January 1, 1895, to a stake on the railway trestle off the point.

*Micco post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure about 1 mile to the southward and eastward of Grant Farm.

*St. Lucie post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure nearly five-eighths mile W.  $\frac{1}{2}$  N. from its former location.

*North Narrows post light, Indian River, Florida.*—Moved, January 31, 1895, about three-eighths mile NNW. of its former location.

*Barlow Point range (front) post light, Columbia River, Washington.*—Moved, February 8, 1895, to a new structure.

*Fairport Pierhead range (front) light, Lake Erie, Ohio.*—Moved, February 1, 1895, 122 feet to the southward of its former location.

*Grosse Isle South Channel range lights, Detroit River, Michigan.*—On March 30, 1895, the front and rear lights of this range were reestablished, each in a new structure, and the heights changed, respectively, to 30 feet and 50 feet above the level of the river.

*Lake Huron light-vessel, No. 61, off the entrance to the St. Clair River, Michigan.*—Moved, on the opening of navigation 1895, to a position 9,125 feet N.  $19^{\circ} 53'$  E. (N.  $\frac{3}{4}$  E.) from Fort Gratiot light-house.

*Grand Haven Pierhead light, Lake Michigan, Michigan.*—Moved, May 4, 1895, 511 feet nearer the outer end of the south pier.

#### NEW BUOYS.

During the fiscal year the following-named special buoys were established:

*Trinity Shoal, Gulf coast of Louisiana.*—A bell buoy, August 15, 1894.

*Lloyd Point, Shoal, off Lloyd Neck, Long Island Sound, New York.*—A bell buoy, September 13, 1894.

*Sewell Point, Hampton Roads, Virginia.*—A bell buoy, September 19, 1894.

*Baker Shoal, Delaware River, New Jersey.*—A gas-lighted buoy, September 29, 1894.

*Bishop Rock Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, October 19, 1894.

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Staniford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Break-water light-station.

## BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

## TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.

- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (iron) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.

*Cape San Blas light, Gulf coast of Florida.*—Extinguished during the gale of October 8 and 9, 1894, owing to the undermining of the tower and carrying away of part of the station.

*Cornfield Point light-vessel, No. 51, Long Island Sound, Connecticut.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 20, showing a fixed white reflector light instead of an occulting electric light, and sounding a bell struck by hand instead of a steam fog signal, November 8, 1894. Relief light-vessel No. 20 broke adrift from her moorings November 16, and was replaced November 21, 1894. Light-vessel No. 20 withdrawn and permanently replaced by light-vessel No. 48, January 15, 1895. Steam fog signal disabled and bell struck by hand January 26, 1895. Steam fog signal repaired and put into operation February 17, 1895.

*Point Conception light-station, seacoast of California.*—Characteristic of fog signal modified owing to scarcity of water November 8, 1894. Characteristic of signal reestablished December 13, 1894.

*Key West light-station, Florida.*—Third-order light extinguished and lens-lantern light, without red sectors, substituted November 30, 1894, to remain during the work of increasing height of tower. Third-order light with red sectors reestablished and temporary light extinguished February 5, 1895.

*Bar Point light-vessel, No. 59, mouth of Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 9, 1895.

*Limekiln Crossing light-vessel (south), No. 64, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Limekiln Crossing light-vessel (north), No. 65, Detroit River Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Ballard Reef light-vessel, No. 63, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Lake Huron light-vessel, No. 61, Lake Huron, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April, 1895.

*Poe Reef light-vessel, No. 62, easterly entrance to the Straits of Mackinac, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 21, 1895.

*Simmons Reef light-vessel, No. 55, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 10, 1894. Replaced April 24, 1895.

*White Shoal light-vessel, No. 56, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.

- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

Columbian Exhibition in Chicago to light the electric buoys along the lake front. It is described in detail in "Report on electric buoys," by Lieut. Commander C. H. West, U. S. N., Report of the Light-House Board, 1893. The cable was made by the Bishop Gutta-Percha Company, New York, and consisted of a single core of seven No. 16 B. & S. copper wires, three-sixteenths inch thick pure gutta-percha insulation, one-fourth inch thick layer of tarred jute, and an armor of sixteen No. 5 iron wires.

Through the courtesy of the Western Union Telegraph Company, the twin-screw cable steamer *Western Union* laid the cable on September 30, 1894. The illustration, Pl. II, shows the manner of taking the cable on steam reel aboard the *Western Union* preparatory to laying it; all other cable laying and handling was done by the tender *Gardenia*, under the skillful direction of Capt. C. A. Ruland. The half mile under-ground portion was connected with the submarine portion through a junction box buried in the sand at the shore end. This enabled the cable to be tested in either direction whenever necessary. From the submerged junction box a short length of cable was laid to another larger junction box containing a step-down transformer, so constructed as to be unaffected by submersion. The core of the cable was grounded upon the armor of the cable through the higher resistance coil of this transformer. This latter was proportioned electrically for the particular circuits connected to it, and operated with closed magnetic circuit. Details of design and construction are not here given in this general report. The two terminals of the lower resistance coil were grounded through a grid laid upon the sea bottom. This grid consisted of three insulated copper wires, each of 27 No. 10 wires (equivalent to No. 3/0 B. & S.), each 1,200 feet long and laid parallel about 300 feet apart. At one end the three were connected together and to one terminal of the lower resistance coil of the transformer. Each of the other three ends were grounded on a netting of 500 square feet of 3-inch mesh No. 12 copper wire. The other terminal of the transformer was grounded on 1,500 square feet of similar copper netting. These grounds were rolled up and handled with ease by the sailors while laying them from small boats. The center of the grid was approximately the ship's moorings. It is evident that the grid constructed thus was of exceedingly low resistance.

A current entering the grid could diffuse itself into the water from and between the wire nettings and establish a diffusion area around the light-ship. Experiments showed that, generally speaking, any two points on the water's surface, over this area, a hundred feet or so apart, would be at different electrical potentials and sufficient for practical telephonic purposes. The diffusion lines, whether due to leakage or induction, were sufficiently well distributed to produce operation of the telephone in any position of the ship, although differences in intensity were observed. Through the kindness of Hammond V. Hayes, Ph. D., chief electrician, American Bell Telephone Company, powerful low-resistance carbon transmitters were obtained, and measurements were made in the laboratory at the light-house station at Tompkinsville to determine the best conditions of action of these. Results beyond the requirements of the circuits to be employed are not recorded here. Several ampere-meters, including a Whitney reading to 5 amperes in twentieths, were all found to be wholly unreliable, as their impedance for rapid alterations was too great for low-resistance circuits. In fact, it was found that no form of coil amperemeter could be used. A hot-wire amperemeter was then devised and constructed. The accompanying cut, Pl. III, is a photograph of the same. It was calibrated with a Standard Weston Amperemeter. It was found that the greatest amount of energy obtainable by shouting or singing into the transmitter was about 1.5 to 2 watts, and the average strength of current through the carbon contacts about 2.2 amperes. The maximum energy that could be delivered to the submerged transformer over the line by these transmitters did not exceed 1 watt. The capacity of the transformers was about 100 times this. When used with the cable a suitable induction coil was interposed between the transmitter contacts and the cable.

*Sand Spit beacon light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 29, 1895.

*Roha Hook post light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 27, 1895.

*Nashua post light, St. Johns River, Florida.*—Structure knocked down by a tow and light extinguished April 10; light on temporary stake April 11; structure rebuilt and light reestablished as before April 21, 1895.

*East Haddam Meadows post light, Connecticut River, Connecticut.*—Discontinued from April 15 to April 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—Twenty-six lights established April 15 to remain one calendar month. Lights reestablished May 15, 1895, to remain until permanent system is established. Two additional temporary lights established May 16.

*Dog River Bar beacon light No. 1, Mobile Bay, Alabama.*—Changed from fixed red to fixed white April 15, 1895, to remain so during the existence of the temporary system of lighting Mobile Bay Dredged Channel.

*Choctaw Pass Channel range (rear) beacon No. 3, Mobile Bay, Alabama.*—Discontinued from April 15 to May 4, 1895.

*Press Barn Bar range (front) post light, Connecticut River Connecticut.*—Discontinued from April 17 to May 20, 1895, on account of the heavy freshets.

*Gedney and Bayside Range Out Channels, entrance to New York Lower Bay, New York and New Jersey.*—An experimental system of ten electrically lighted spar buoys was established and operated during daylight from May 2 to July 1, 1895. At night the buoys were lighted with oil lanterns.

*Delaware Breakwater (east end) light-station, entrance to Delaware Bay, Delaware.*—The fog signal at this station was disabled from May 5 to May 9, 1895.

*South Pass light-vessel, No. 43, off South Pass entrance to the Mississippi River, Louisiana.*—Withdrawn from her station for the summer months May 18, 1895.

*Wreck of the Kate Kelly light, Lake Michigan, Michigan.*—A white lantern light established June 15, 1895. (Discontinued October 11, 1895.)

*Martins Industry light-vessel, No. 1, off Port Royal entrance, South Carolina.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 29, sounding a bell struck by hand instead of a steam fog signal, June 20, 1895. (Relief light-vessel No. 29 withdrawn and light-vessel No. 1 replaced August 20, 1895.)

*Execution Rocks, Long Island Sound, New York.*—The easterly edge of the red sector was corrected December 8, 1894, to bear NE.  $\frac{1}{4}$  N. and guide clear of the south end of Hart Island.

*Coon Island post light, entrance to the Willamette River, Oregon.*—Changed December 18, 1894, from red to white.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from light-vessel No. 20, temporarily marking the station, to light-vessel No. 48; characteristic changed to two reflector lights, the one on the foremast showing a white flash every 30 seconds, and that on the mainmast showing fixed red; height decreased from 54 feet to 37 feet, January 15, 1895.

*Muskegon Pierhead, Lake Michigan, Michigan.*—Changed, January 16, 1895, to illuminate the entire horizon.

*Grant Farm (lower) post light, Indian River, Florida.*—Changed from white to red, the color of its day mark from black to red, and its number to 14 $\frac{1}{2}$ , January 31, 1895.

*Port Penn range (front), Delaware River, Delaware.*—Changed February 14, 1895, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed February 28, 1895, from fixed white varied by a white flash every 10 seconds, to fixed white varied by a white flash every 25 seconds.

*Cubits Gap post light, Mississippi River, Louisiana.*—Changed from fixed white to fixed red, March 1, 1895.

*Waackaack, New York Bay, New Jersey.*—Changed by the substitution of a third-order for the first-order lamp in each of the two range lenses, April 18, 1895.

*Sand Spit, Hudson River, New York.*—Exhibited from a new structure, a dolphin of five piles, May 2, 1895.

*Ahnapee Pierhead range (rear), Lake Michigan, Wisconsin.*—Changed, June 6, 1895, from a lens-lantern to a fifth-order light.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Changed, June 8, 1895, from the schooner *Drift* to light-vessel No. 46, from two lens-lantern to two reflector lights, and from 57 to 45 feet in height.

*Yaquina Bar range (rear) beacon, Yaquina Bay, Oregon.*—Height increased to 30 $\frac{1}{4}$  feet, June 18, 1895.

*Mahon River, Delaware Bay, Delaware.*—Changed, June 29, 1895, from fixed white to fixed white with a narrow fixed red sector between S. 26° 15' W. (SSW.  $\frac{3}{4}$  W.) and S. 31° 25' W. (SSW.  $\frac{3}{4}$  W.).

#### CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in fog signals:

*North Hook beacon, Sandy Hook, New Jersey.*—The characteristic of the siren was changed, November 30, 1894, to sound blasts of 3 seconds, separated by silent intervals of 27 seconds' duration.



*Sandy Hook light-vessel, entrance to New York Bay, New York.*—The 12-inch steam whistle was changed, December 5, 1894, to sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed, January 7, 1895, from a bell struck by hand to a Daboll trumpet sounding blasts of 3 seconds' duration, separated by silent intervals of 7 seconds.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from a 12-inch to a 10-inch steam whistle, and from blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, to blasts of 3 seconds' duration, separated by alternate silent intervals of 1 second and 30 seconds, January 15, 1895.

*St. George Reef, off the seacoast of California.*—Changed, March 1, 1895, to sound blasts of 5 seconds' duration, separated by silent intervals of 75 seconds.

*Fort Gratiot, Lake Huron, Michigan.*—Changed, April 8, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 17 seconds.

*Buffalo Breakwater (north end), Lake Erie, New York.*—Changed, June 1, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 57 seconds.

*Avery Rock, Machias Bay, Maine.*—Changed, June 20, 1895, from a blow every 11 seconds to a blow every 10 seconds.

*Pond Island, mouth of the Kennebec River, Maine.*—Changed, June 20, 1895, from a blow every  $8\frac{1}{2}$  seconds to a blow every 10 seconds.

#### CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

*Grand Haven Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 6, 1894, 278 feet nearer the outer end of the south pier.

*New Channel range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 320 feet NNW.  $\frac{3}{8}$  W., from its former position.

*New Channel range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 350 feet NNW.  $\frac{1}{4}$  W., from its former position.

*Smith Island range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 1,600 feet W.  $\frac{5}{8}$  N. from its former position.

*Smith Island range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 2,100 feet NW.  $\frac{1}{8}$  W. from its former position.

*Muskegon Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 20, 1894, 323 feet nearer the outer end of the south pier.

- Cape Canaveral light, seacoast of Florida.*—Moved, July 25, 1894, 5,200 feet S.  $87^{\circ} 24'$  W. (W.  $\frac{1}{4}$  S.) from its former position.
- Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Moved, July 26, 1894, a little to the southward and westward.
- Northeast End light-vessel No. 44, off the seacoast of New Jersey.*—Moved, September 1, 1894, about 2 miles E.  $\frac{3}{4}$  S. from her former moorings.
- Five-Fathom Bank light-vessel No. 40, off the seacoast of New Jersey.*—Moved, September 1, 1894, about  $1\frac{1}{2}$  miles SE. by S. from her former moorings.
- Barlow Point post light, Columbia River, Washington.*—Moved, September 8, 1894, about 1,400 feet WNW. from its former position.
- Scotch Cap post light, Thames River, Connecticut.*—Moved, September 10, 1894, from the west bank of the river S. by E. to a location in 6 feet of water.
- Marquette Breakwater light, Lake Superior, Michigan.*—Moved, October 1, 1894, about 1,000 feet to the outer end of the extended breakwater.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 7, 1894, northwesterly, along the range line, 20 feet from its former position.
- Waackaack (main channel range, rear) light, New York Bay, New Jersey.*—Moved, October 25, 1894, 52 feet westerly, along the main channel range, to the position occupied previous to November, 1892.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 29, 1894, northwesterly, along the range line, 20 feet from its former position.
- Fort Mifflin fog signal, Delaware River, Pennsylvania.*—Moved, November 19, 1894, from the dock to the parapet back of the dock at Fort Mifflin.
- Kewaunee Pierhead range (rear) light, Lake Michigan, Wisconsin.*—Moved November 2, 1894, 300 feet nearer the outer end of the north pier.
- Winter Point range (rear) light, St. Marys River, Michigan.*—Moved, November 3, 1894, to a point on the westerly prolongation of the range line 675 feet in rear of the front light.
- Twin River Point light, Lake Michigan, Wisconsin.*—Moved November 19, 1894, to a new tower, located 47 feet S.  $68^{\circ} 30'$  W. (WSW.  $\frac{1}{4}$  W.) from the former tower.
- Salisbury Beach range lights, entrance to Newburyport Harbor, Massachusetts.*—Moved, November 20, 1894, about one-fourth mile NNE. from their former location, to mark the line of best water across the bar.

- Beacon 1 post light, Columbia River, Oregon.*—Moved, December 1, 1894, into 14 feet of water about five-eighths mile westerly from its former position.
- South Pass light-vessel, No. 43, off South Pass, entrance to the Mississippi River, Louisiana.*—Moved, December 3, 1894, into 82 feet of water about 1 mile NE. from her former moorings.
- Cubits Gap post light, Mississippi River, Louisiana.*—Moved, January 1, 1895, about one-third mile up the river and exhibited from the fog-bell tower at a height of 35 feet.
- Smith Point post light, Columbia River, Oregon.*—Moved, January 1, 1895, to a stake on the railway trestle off the point.
- Micco post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure about 1 mile to the southward and eastward of Grant Farm.
- St. Lucie post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure nearly five-eighths mile W.  $\frac{1}{2}$  N. from its former location.
- North Narrows post light, Indian River, Florida.*—Moved, January 31, 1895, about three-eighths mile NNW. of its former location.
- Barlow Point range (front) post light, Columbia River, Washington.*—Moved, February 8, 1895, to a new structure.
- Fairport Pierhead range (front) light, Lake Erie, Ohio.*—Moved, February 1, 1895, 122 feet to the southward of its former location.
- Grosse Isle South Channel range lights, Detroit River, Michigan.*—On March 30, 1895, the front and rear lights of this range were reestablished, each in a new structure, and the heights changed, respectively, to 30 feet and 50 feet above the level of the river.
- Lake Huron light-vessel, No. 61, off the entrance to the St. Clair River, Michigan.*—Moved, on the opening of navigation 1895, to a position 9,125 feet N.  $19^{\circ} 53'$  E. (N.  $\frac{3}{4}$  E.) from Fort Gratiot light-house.
- Grand Haven Pierhead light, Lake Michigan, Michigan.*—Moved, May 4, 1895, 511 feet nearer the outer end of the south pier.

## NEW BUOYS.

During the fiscal year the following-named special buoys were established:

- Trinity Shoal, Gulf coast of Louisiana.*—A bell buoy, August 15, 1894.
- Lloyd Point, Shoal, off Lloyd Neck, Long Island Sound, New York.*—A bell buoy, September 13, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, September 19, 1894.
- Baker Shoal, Delaware River, New Jersey.*—A gas-lighted buoy, September 29, 1894.
- Bishop Rock Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, October 19, 1894.

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Staniford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Break-water light-station.

#### BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

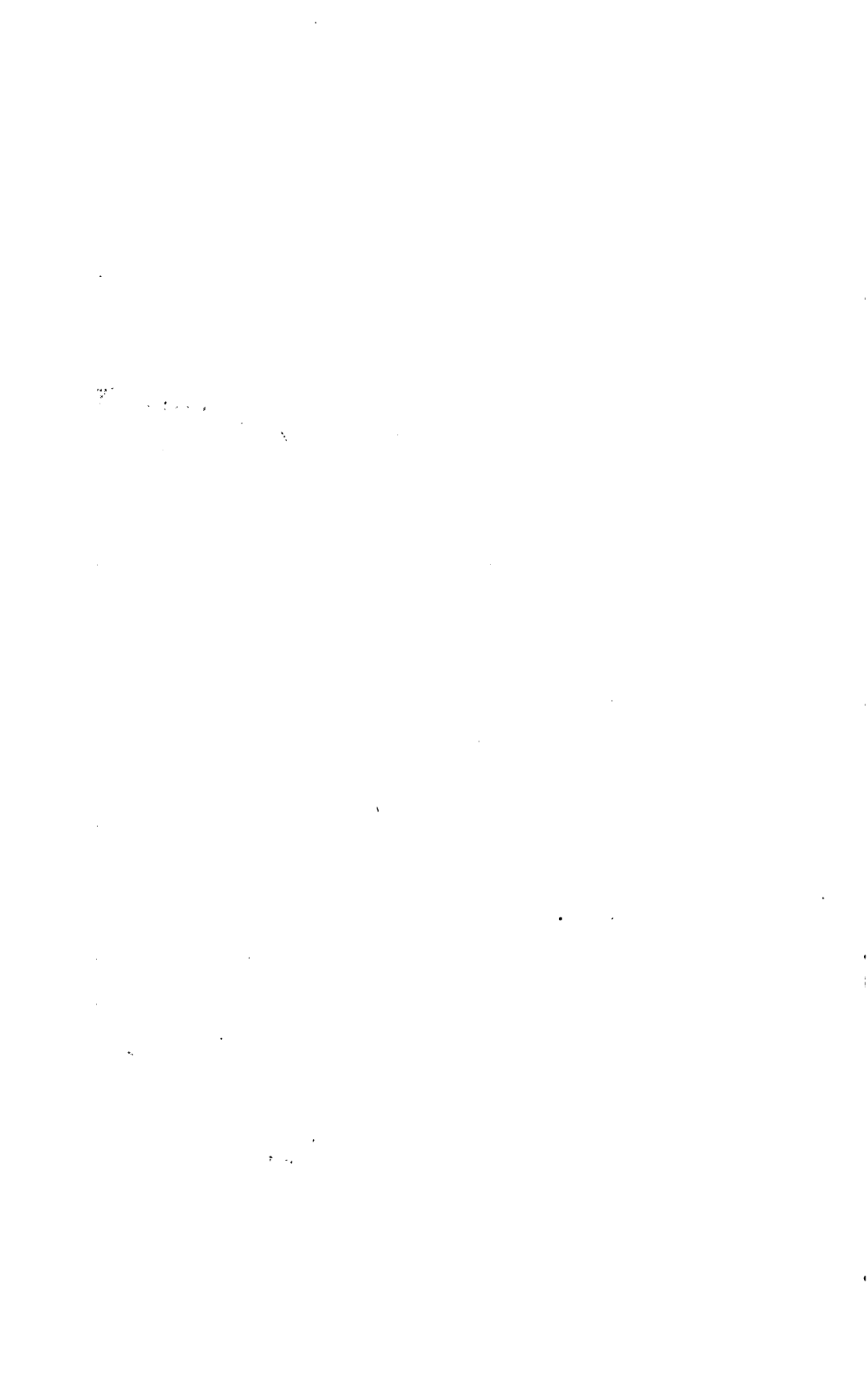
- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

#### TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.

- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.



- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

*Long Reach (upper) post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and light reestablished April 3, 1895.

*Pride Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 3; rebuilt and light reestablished April 3, 1895.

*Burnt House Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 8; rebuilt and light reestablished April 3, 1895.

*Execution Rocks light-station, westerly end of Long Island Sound, New York.*—Fog signal disabled and discontinued from March 9 to March 28, 1895.

*Nine-Mile Point post light, St. Johns River, Florida.*—Structure destroyed by fire and light shown from temporary stake March 25; structure rebuilt and light reestablished as before April 22, 1895.

*Hell Gate post light, East River, New York.*—Characteristic changed to fixed red above fixed white March 30; former characteristic restored April 18, 1895.

*Mouse Island (lower) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.

*Mouse Island (upper) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—A gas-lighted buoy was established on either side of the mouth of the dredged channel April 4. West side buoy moved about 2 miles to southward and placed on east side of channel and east side buoy moved about 1 mile to southward May 15, 1895.

*Bath Dike post light, Hudson River, New York.*—Structure carried away by a freshet and light extinguished April 9; structure rebuilt and light reestablished April 11, 1895.

*Pleasure Island post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.

*Covells Folly post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.

*Green Flats post light, Hudson River, New York.*—Structure destroyed by freshet and light extinguished April 9; rebuilt and light reestablished May 1, 1895.

*Colt Pier range (front) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.

*Colt Pier range (rear) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.



*Sand Spit beacon light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 29, 1895.

*Roha Hook post light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 27, 1895.

*Nashua post light, St. Johns River, Florida.*—Structure knocked down by a tow and light extinguished April 10; light on temporary stake April 11; structure rebuilt and light reestablished as before April 21, 1895.

*East Haddam Meadows post light, Connecticut River, Connecticut.*—Discontinued from April 15 to April 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—Twenty-six lights established April 15 to remain one calendar month. Lights reestablished May 15, 1895, to remain until permanent system is established. Two additional temporary lights established May 16.

*Dog River Bar beacon light No. 1, Mobile Bay, Alabama.*—Changed from fixed red to fixed white April 15, 1895, to remain so during the existence of the temporary system of lighting Mobile Bay Dredged Channel.

*Choctaw Pass Channel range (rear) beacon No. 3, Mobile Bay, Alabama.*—Discontinued from April 15 to May 4, 1895.

*Press Barn Bar range (front) post light, Connecticut River Connecticut.*—Discontinued from April 17 to May 20, 1895, on account of the heavy freshets.

*Gedney and Bayside Range Cut Channels, entrance to New York Lower Bay, New York and New Jersey.*—An experimental system of ten electrically lighted spar buoys was established and operated during daylight from May 2 to July 1, 1895. At night the buoys were lighted with oil lanterns.

*Delaware Breakwater (east end) light-station, entrance to Delaware Bay, Delaware.*—The fog signal at this station was disabled from May 5 to May 9, 1895.

*South Pass light-vessel, No. 43, off South Pass entrance to the Mississippi River, Louisiana.*—Withdrawn from her station for the summer months May 18, 1895.

*Wreck of the Kate Kelly light, Lake Michigan, Michigan.*—A white lantern light established June 15, 1895. (Discontinued October 11, 1895.)

*Martins Industry light-vessel, No. 1, off Port Royal entrance, South Carolina.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 29, sounding a bell struck by hand instead of a steam fog signal, June 20, 1895. (Relief light-vessel No. 29 withdrawn and light-vessel No. 1 replaced August 20, 1895.)

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*Aids to navigation maintained by the Light-House Board, June 30, 1895.*

Aids.	First district.	Second district.	Third district.	Fourth district.	Fifth district.	Sixth district.	Seventh district.	Eighth district.	Ninth district.	Tenth district.	Eleventh district.	Twelfth district.	Thirteenth district.	Fourteenth district.	Fifteenth district.	Sixteenth district.	Atlantic coast.	Pacific coast.	Lake coast.	Western rivers.	Total entire coast.		Increase or decrease.
Electric lights.....	1	4	1	5	6	7	8	2	2	2	2	9	9	2	2	2	2	2	2	2	2	2	2
First-order lights.....	2	4	6	5	6	7	8	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1
Second-order lights.....	7	3	1	3	3	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Third-order lights.....	6	1	5	3	3	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Three-and-a-half-order lights.....	19	23	38	13	41	7	6	13	32	23	32	10	7	15	17	105	105	105	105	105	105	105	105
Fourth-order lights.....	24	16	20	7	22	4	1	14	14	16	14	5	2	12	17	105	105	105	105	105	105	105	105
Fifth-order lights.....	1	5	31	3	11	6	1	12	18	16	12	12	12	12	12	12	12	12	12	12	12	12	12
Sixth-order lights.....	2	3	6	3	19	7	7	1	4	14	44	4	12	4	16	47	47	47	47	47	47	47	47
Lens lanterns.....	10	10	6	8	2	14	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Range lenses.....	3	6	127	7	9	155	15	59	16	3	49	7	83	528	524	359	359	359	359	359	359	359	359
Reflectors.....	10	10	7	4	3	3	3	2	4	4	3	1	1	1	1	1	1	1	1	1	1	1	1
Tubular and other lanterns.....	3	6	127	7	9	155	15	59	16	3	49	7	83	528	524	359	359	359	359	359	359	359	359
Light-vessels in position.....	10	10	7	4	3	3	3	2	4	4	3	1	1	1	1	1	1	1	1	1	1	1	1
Electric buoys.....	4	4	3	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Gas buoys.....	4	4	3	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total lighted aids.....	64	88	262	63	118	208	44	103	100	76	168	39	115	528	524	359	911	154	383	1,411	2,780	2,859	79
Fog signals operated by steam or hot air.....	13	10	16	6	4	2	3	1	23	6	24	15	10	3	3	3	52	25	53	.....	125	130	5
Fog signals operated by clockwork.....	17	10	50	7	63	3	3	11	7	3	4	7	3	.....	.....	.....	180	10	15	.....	186	185	1
Day beacons.....	103	73	40	5	10	50	36	13	.....	.....	.....	49	42	2	.....	.....	330	91	1	2	412	424	12
Whistling buoys.....	11	12	5	4	1	6	3	4	.....	.....	.....	12	8	.....	.....	.....	46	20	.....	.....	66	66	.....
Bell buoys.....	18	15	22	6	1	15	5	2	.....	.....	.....	6	4	.....	.....	.....	84	10	2	.....	92	96	4
Other buoys.....	635	510	576	187	1,079	298	256	101	93	146	322	73	271	.....	.....	.....	3,462	344	561	.....	4,438	4,547	100
Total unlighted aids.....	797	630	709	215	1,158	374	300	132	123	155	353	162	338	2	.....	.....	4,314	500	632	2	5,319	5,448	129
Total number of aids.....	861	718	971	278	1,276	582	344	235	223	231	521	201	453	530	524	359	5,225	654	1,015	1,413	8,099	8,307	208

*Appropriations made at the third session of the Fifty-third Congress for light-house purposes.*

Supplies of light-houses.....	\$385,000
Repairs of light-houses .....	490,000
Salaries of light-keepers.....	690,000
Expenses of light-vessels .....	285,000
Expenses of buoyage .....	415,000
Expenses of fog signals.....	70,000
Inspecting lights .....	3,000
Lighting rivers .....	300,000
Survey of light-house sites.....	1,000

**SPECIAL WORKS.**

Boston light-vessel, additional.....	35,000
Butler Flat, Massachusetts .....	45,000
Chequamegon Point light and fog-signal station, Wisconsin.....	10,000
Detroit River lights, Michigan, north and south ends of Grass Island.....	6,700
Devils Island light and fog-signal station, Wisconsin.....	22,000
Eagle Harbor fog signal, Michigan .....	5,000
Grand Marais light-station, Michigan (making available).....	4,000
Grand Marais Harbor of Refuge, light and bell, Michigan.....	15,000
Grays Harbor light and fog-signal station, Washington.....	39,500
Kennebec River lights, Maine.....	17,000
Lower Cedar Point light-station, Potomac River, Maryland (with power to contract up to \$75,000).....	25,000
Manitowoc fog signal, Wisconsin.....	5,500
Maumee range light-station .....	20,000
Mendota light-station, Michigan .....	7,500
Mobile Ship Channel lights, Alabama.....	30,000
North Head light-station, Washington.....	25,000
North Manitou light and fog signal, Michigan.....	20,000
Oil houses for light-stations.....	5,000
Plum Beach light and fog-signal station, Rhode Island (with power to contract up to \$60,000) .....	20,000
Portage Lake Ship Canal Pierhead fog signal, Michigan.....	5,500
Porte des Morts range lights and fog-signal station, Michigan.....	21,000
Sheboygan fog signal, Wisconsin.....	5,500
Smith Point light-house, Chesapeake Bay, Maryland (with power to contract up to \$80,000) .....	25,000
South Fox Island fog signal, Michigan .....	5,500
Southwest Ledge fog signal, Connecticut.....	3,000
Spectacle Island range lights, Massachusetts.....	9,350
Spring Point Ledge light and fog signal, Maine (with power to contract up to \$45,000) .....	20,000
Squaw Point light, Michigan.....	5,000
Staten Island light-house depot sea wall .....	25,000
Sturgeon Bay Canal light-station, Wisconsin.....	20,000
Tibbetts Point fog signal, New York .....	4,300
Umatilla Reef light-vessel, Washington (with power to contract up to \$80,000).....	40,000

**NEW WORKS AUTHORIZED.**

Congress authorized, by act approved on February 15, 1893, the establishment of a number of light-stations at an aggregated cost of nearly half a million dollars, but made no appropriation at that time for their

construction. Since then, from time to time, appropriation has been made for the erection of many of them. The following is a list of the light-stations remaining for which no appropriation has yet been made, with the maximum amount which each may cost:

Galloo Island fog signal, New York.....	\$5, 700
Carlton Island light-house, New York.....	8, 600
Bay State Shoal lights, New York.....	800
Erie Harbor (Presqu'ile) fog signal, Pennsylvania.....	4, 300
Fairport Harbor fog signal, Ohio.....	4, 300
Lorain Harbor (Black River) fog signal, Ohio.....	4, 300
Port Clinton light, Ohio, reestablishing.....	1, 500
Poe Reef light-vessel, Straits of Mackinac, Michigan.....	25, 000
Big Sable Point fog signal, Michigan.....	5, 500
Sand Hills light-house, Michigan.....	20, 000
Bayfield light and fog signal, Wisconsin.....	5, 000
Pats (or Hat) Point light and fog signal, Minnesota.....	15, 000
Ludington light and fog-signal station, Michigan, keeper's dwelling.....	4, 500
St. Joseph fog signal, Michigan.....	5, 000
St. Martin Island light, Michigan.....	15, 000
Little Gull Island light and fog signal, Michigan.....	20, 000
Peshigo Shoal, Green Bay, Wisconsin.....	10, 000
Wilson Harbor light, New York.....	2, 500
Big Oyster Bed Shoal light and fog signal, New Jersey.....	25, 000
Deer Point light, Florida.....	1, 000
New York Slough light and fog signal, California.....	10, 000
Mermontean River light, Louisiana.....	7, 000
Willamette River, Oregon, 25 beacon lights and buoys between Salem and Portland.....	5, 000

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report, under specified headings, from which it will be evident that the Board has brought the numerous and varied aids to navigation under its charge up to the proper standard, and that it has done all that was possible, with the funds provided, to meet the requirements of commerce and navigation.

#### SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1895 was \$385,000. While the appropriation was the same as that of the previous year, the number of light-stations was increased, and it is reasonable to expect that appropriations will be made during the present session of Congress for still other light-stations.

The Board has found it impossible, with funds provided, to keep up its reserve stock of supplies with which to meet emergencies. This stock has been heavily drawn upon. The meagerness of preceding appropriations has made it necessary for the Board to cut down the quantity of supplies furnished yearly to the light-houses to such an extent that it can go no further without danger to the lights. In spite of the severe economy used, there is danger that the present lights and those which are being built can not be properly kept up without an

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Staniford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Break-water light-station.

## BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

## TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.

- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.

*Cape San Blas light, Gulf coast of Florida.*—Extinguished during the gale of October 8 and 9, 1894, owing to the undermining of the tower and carrying away of part of the station.

*Cornfield Point light-vessel, No. 51, Long Island Sound, Connecticut.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 20, showing a fixed white reflector light instead of an occulting electric light, and sounding a bell struck by hand instead of a steam fog signal, November 8, 1894. Relief light-vessel No. 20 broke adrift from her moorings November 16, and was replaced November 21, 1894. Light-vessel No. 20 withdrawn and permanently replaced by light-vessel No. 48, January 15, 1895. Steam fog signal disabled and bell struck by hand January 26, 1895. Steam fog signal repaired and put into operation February 17, 1895.

*Point Conception light-station, seacoast of California.*—Characteristic of fog signal modified owing to scarcity of water November 8, 1894. Characteristic of signal reestablished December 13, 1894.

*Key West light-station, Florida.*—Third-order light extinguished and lens-lantern light, without red sectors, substituted November 30, 1894, to remain during the work of increasing height of tower. Third-order light with red sectors reestablished and temporary light extinguished February 5, 1895.

*Bar Point light-vessel, No. 59, mouth of Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 9, 1895.

*Limekiln Crossing light-vessel (south), No. 64, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Limekiln Crossing light-vessel (north), No. 65, Detroit River Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Ballard Reef light-vessel, No. 63, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Lake Huron light-vessel, No. 61, Lake Huron, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April, 1895.

*Poe Reef light-vessel, No. 62, easterly entrance to the Straits of Mackinac, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 21, 1895.

*Simmons Reef light-vessel, No. 55, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 10, 1894. Replaced April 24, 1895.

*White Shoal light-vessel, No. 56, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.



- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

*Conch Bar post light, No. 36, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Solomons Lump, Chesapeake Bay, Maryland.*—A lens-lantern light, February 22, 1895. (Wreck of structure carried away by ice.)

*Venus Point range (front), entrance to Savannah River, South Carolina.*—A reflector light, March 18, 1895.

*Maumee outer range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.

*Maumee middle range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.

*Maumee inner range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.

*Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—A lantern light, May 4, 1895.

*Orange Park post light, No. 38, St. Johns River, Florida.*—A tubular-lantern light, May 10, 1895.

#### FOG SIGNAL DISCONTINUED.

During the fiscal year the following-named fog signal was discontinued:

*Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A 12-inch steam whistle, August 15, 1894.

#### CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

*Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—Changed July 6, 1894, from a tubular-lantern to a lantern light.

*New Channel range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from tubular-lantern to lens-lantern lights. Height of front and rear lights increased, respectively, to 20 feet and 38 feet.

*Smith Island range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from lens-lantern to lantern lights. Height of front and rear lights increased, respectively, 2 feet and 3 feet.

*Maumee Bay ranges, Maumee Bay, Ohio.*—Luminous intensity of lights increased July 20, 1894, by changing the front and east lights from reflector to lens-lantern lights, and the west light from a reflector to a lantern light.

*Muskegon Pierhead range (front), Lake Michigan, Michigan.*—Changed July 21, 1894, from a tubular-lantern light to a lantern light.

*Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Changed from light-vessel No. 54 to light-vessel No. 58, July 26, 1894.

- Barlow Point post light, Columbia River, Washington.*—Changed September 8, 1894, from a cluster of piles to an arm on a tree.
- La Du post light, Columbia River, Washington.*—Changed from fixed red to fixed white, September 8, 1894.
- St. Helens Jetty post light, Columbia River, Washington.*—Changed from fixed red to fixed white, and from a framework to a gallows frame, September 8, 1894.
- Cherry Island range (front), Delaware River, Delaware.*—Changed September 20, 1894, from fixed to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Waackaack (main channel range, rear), New York Bay, New Jersey.*—Changed to a new structure, height increased from 76 to 101½ feet, and luminous intensity increased by changing to a second-order range lens, October 25, 1894.
- Finns. Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- New Castle range (front) Delaware River, Delaware.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Deep Water Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Schooner Ledge range (front), Delaware River, Pennsylvania.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Billingsport range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Rock Island, St. Lawrence River, New York.*—Height increased to 45 feet in October, 1894.
- Beacon 1 post light, Columbia River, Oregon.*—Changed December 1, 1894, from red to white.
- Sandy Hook light-vessel, entrance to New York Bay, New York.*—Changed from light-vessel No. 48 to light-vessel No. 51; characteristic changed from one flashing red and one fixed red reflector light to one fixed white electric light, shown simultaneously from a group of four lens lanterns, during periods of 12 seconds' duration separated by an eclipse of 3 seconds' duration; height increased from 37 feet to 54 feet, December 5, 1894.
- Scotland light-vessel, No. 7, entrance to New York Bay, New Jersey.*—Changed December 5, 1894, from two fixed white to two fixed red lights.
- Ram Island Reef light-vessel, Fishers Island Sound, New York.*—Changed December 8, 1894, from light-vessel No. 19 to light-vessel No. 23, having a red instead of a straw-colored hull, and black instead of red day marks at the mastheads.



*Sandy Hook light-vessel, entrance to New York Bay, New York.*—The 12-inch steam whistle was changed, December 5, 1894, to sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed, January 7, 1895, from a bell struck by hand to a Daboll trumpet sounding blasts of 3 seconds' duration, separated by silent intervals of 7 seconds.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from a 12-inch to a 10-inch steam whistle, and from blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, to blasts of 3 seconds' duration, separated by alternate silent intervals of 1 second and 30 seconds, January 15, 1895.

*St. George Reef, off the seacoast of California.*—Changed, March 1, 1895, to sound blasts of 5 seconds' duration, separated by silent intervals of 75 seconds.

*Fort Gratiot, Lake Huron, Michigan.*—Changed, April 8, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 17 seconds.

*Buffalo Breakwater (north end), Lake Erie, New York.*—Changed, June 1, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 57 seconds.

*Avery Rock, Machias Bay, Maine.*—Changed, June 20, 1895, from a blow every 11 seconds to a blow every 10 seconds.

*Pond Island, mouth of the Kennebec River, Maine.*—Changed, June 20, 1895, from a blow every  $8\frac{1}{2}$  seconds to a blow every 10 seconds.

#### CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

*Grand Haven Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 6, 1894, 278 feet nearer the outer end of the south pier.

*New Channel range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 320 feet NNW.  $\frac{1}{8}$  W., from its former position.

*New Channel range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 350 feet NNW.  $\frac{1}{4}$  W., from its former position.

*Smith Island range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 1,600 feet W.  $\frac{3}{8}$  N. from its former position.

*Smith Island range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 2,100 feet NW.  $\frac{1}{4}$  W. from its former position.

*Muskegon Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 20, 1894, 323 feet nearer the outer end of the south pier.



- Beacon 1 post light, Columbia River, Oregon.*—Moved, December 1, 1894, into 14 feet of water about five-eighths mile westerly from its former position.
- South Pass light-vessel, No. 43, off South Pass, entrance to the Mississippi River, Louisiana.*—Moved, December 3, 1894, into 82 feet of water about 1 mile NE. from her former moorings.
- Cubits Gap post light, Mississippi River, Louisiana.*—Moved, January 1, 1895, about one-third mile up the river and exhibited from the fog-bell tower at a height of 35 feet.
- Smith Point post light, Columbia River, Oregon.*—Moved, January 1, 1895, to a stake on the railway trestle off the point.
- Micco post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure about 1 mile to the southward and eastward of Grant Farm.
- St. Lucie post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure nearly five-eighths mile W.  $\frac{1}{2}$  N. from its former location.
- North Narrows post light, Indian River, Florida.*—Moved, January 31, 1895, about three-eighths mile NNW. of its former location.
- Barlow Point range (front) post light, Columbia River, Washington.*—Moved, February 8, 1895, to a new structure.
- Fairport Pierhead range (front) light, Lake Erie, Ohio.*—Moved, February 1, 1895, 122 feet to the southward of its former location.
- Grosse Isle South Channel range lights, Detroit River, Michigan.*—On March 30, 1895, the front and rear lights of this range were reestablished, each in a new structure, and the heights changed, respectively, to 30 feet and 50 feet above the level of the river.
- Lake Huron light-vessel, No. 61, off the entrance to the St. Clair River, Michigan.*—Moved, on the opening of navigation 1895, to a position 9,125 feet N.  $19^{\circ} 53'$  E. (N.  $\frac{3}{4}$  E.) from Fort Gratiot light-house.
- Grand Haven Pierhead light, Lake Michigan, Michigan.*—Moved, May 4, 1895, 511 feet nearer the outer end of the south pier.

## NEW BUOYS.

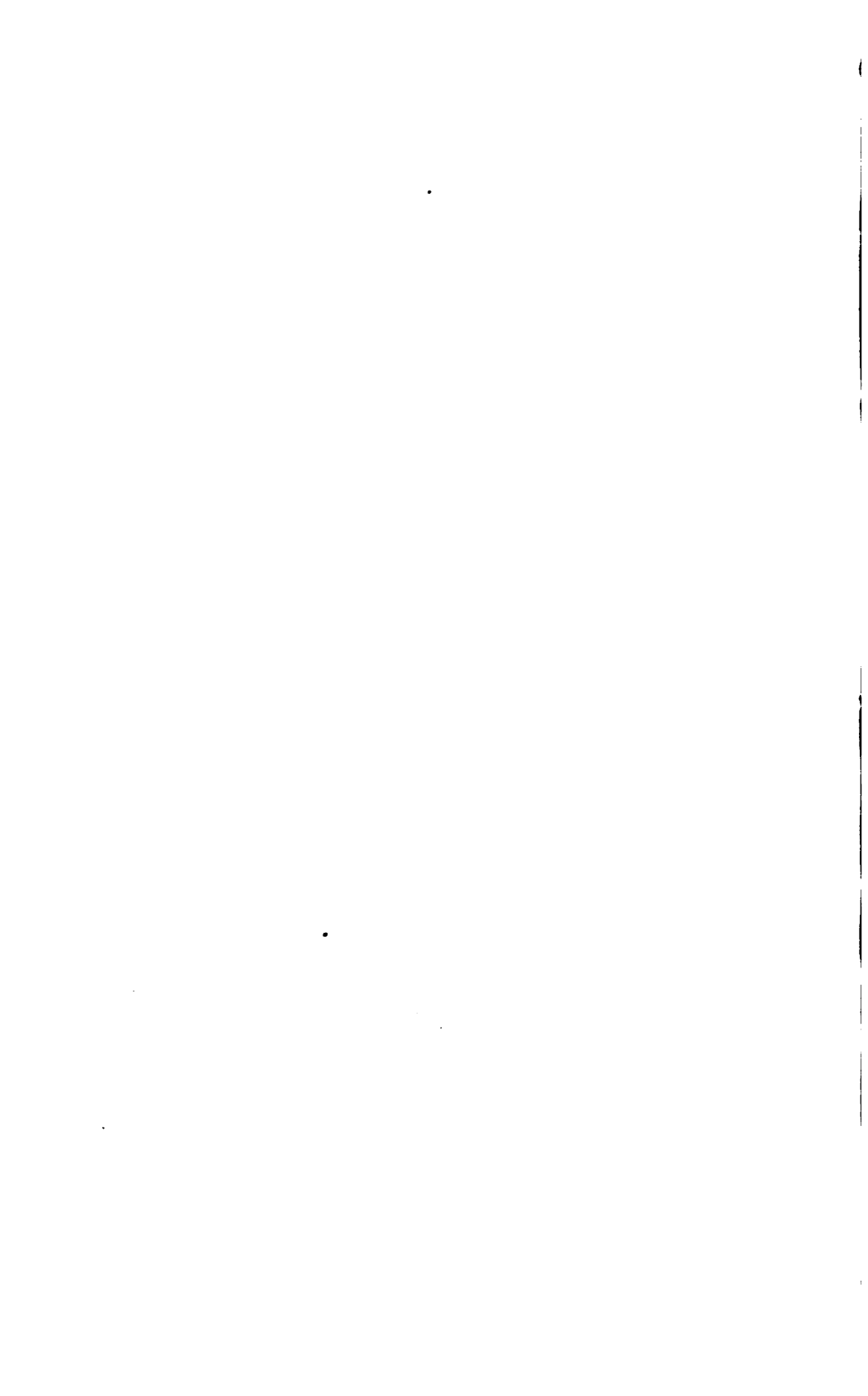
During the fiscal year the following-named special buoys were established:

- Trinity Shoal, Gulf coast of Louisiana.*—A bell buoy, August 15, 1894.
- Lloyd Point, Shoal, off Lloyd Neck, Long Island Sound, New York.*—A bell buoy, September 13, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, September 19, 1894.
- Baker Shoal, Delaware River, New Jersey.*—A gas-lighted buoy, September 29, 1894.
- Bishop Rock Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, October 19, 1894.





- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.



- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

- Conch Bar post light, No. 36, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.
- Solomons Lump, Chesapeake Bay, Maryland.*—A lens-lantern light, February 22, 1895. (Wreck of structure carried away by ice.)
- Venus Point range (front), entrance to Savannah River, South Carolina.*—A reflector light, March 18, 1895.
- Maumee outer range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Maumee middle range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Maumee inner range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—A lantern light, May 4, 1895.
- Orange Park post light, No. 38, St. Johns River, Florida.*—A tubular-lantern light, May 10, 1895.

## FOG SIGNAL DISCONTINUED.

During the fiscal year the following-named fog signal was discontinued:

- Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A 12-inch steam whistle, August 15, 1894.

## CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

- Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—Changed July 6, 1894, from a tubular-lantern to a lantern light.
- New Channel range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from tubular-lantern to lens-lantern lights. Height of front and rear lights increased, respectively, to 20 feet and 38 feet.
- Smith Island range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from lens-lantern to lantern lights. Height of front and rear lights increased, respectively, 2 feet and 3 feet.
- Maumee Bay ranges, Maumee Bay, Ohio.*—Luminous intensity of lights increased July 20, 1894, by changing the front and east lights from reflector to lens-lantern lights, and the west light from a reflector to a lantern light.
- Muskegon Pierhead range (front), Lake Michigan, Michigan.*—Changed July 21, 1894, from a tubular-lantern light to a lantern light.
- Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Changed from light-vessel No. 54 to light-vessel No. 58, July 26, 1894.

- Barlow Point post light, Columbia River, Washington.*—Changed September 8, 1894, from a cluster of piles to an arm on a tree.
- La Du post light, Columbia River, Washington.*—Changed from fixed red to fixed white, September 8, 1894.
- St. Helens Jetty post light, Columbia River, Washington.*—Changed from fixed red to fixed white, and from a framework to a gallows frame, September 8, 1894.
- Cherry Island range (front), Delaware River, Delaware.*—Changed September 20, 1894, from fixed to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Waackaack (main channel range, rear), New York Bay, New Jersey.*—Changed to a new structure, height increased from 76 to 101½ feet, and luminous intensity increased by changing to a second-order range lens, October 25, 1894.
- Finns Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- New Castle range (front) Delaware River, Delaware.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Deep Water Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Schooner Ledge range (front), Delaware River, Pennsylvania.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Billingsport range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Rock Island, St. Lawrence River, New York.*—Height increased to 45 feet in October, 1894.
- Beacon 1 post light, Columbia River, Oregon.*—Changed December 1, 1894, from red to white.
- Sandy Hook light-vessel, entrance to New York Bay, New York.*—Changed from light-vessel No. 48 to light-vessel No. 51; characteristic changed from one flashing red and one fixed red reflector light to one fixed white electric light, shown simultaneously from a group of four lens lanterns, during periods of 12 seconds' duration separated by an eclipse of 3 seconds' duration; height increased from 37 feet to 54 feet, December 5, 1894.
- Scotland light-vessel, No. 7, entrance to New York Bay, New Jersey.*—Changed December 5, 1894, from two fixed white to two fixed red lights.
- Ram Island Reef light-vessel, Fishers Island Sound, New York.*—Changed December 8, 1894, from light-vessel No. 19 to light-vessel No. 23, having a red instead of a straw-colored hull, and black instead of red day marks at the mastheads.



*Sandy Hook light-vessel, entrance to New York Bay, New York.*—The 12-inch steam whistle was changed, December 5, 1894, to sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed, January 7, 1895, from a bell struck by hand to a Daboll trumpet sounding blasts of 3 seconds' duration, separated by silent intervals of 7 seconds.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from a 12-inch to a 10-inch steam whistle, and from blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, to blasts of 3 seconds' duration, separated by alternate silent intervals of 1 second and 30 seconds, January 15, 1895.

*St. George Reef, off the seacoast of California.*—Changed, March 1, 1895, to sound blasts of 5 seconds' duration, separated by silent intervals of 75 seconds.

*Fort Gratiot, Lake Huron, Michigan.*—Changed, April 8, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 17 seconds.

*Buffalo Breakwater (north end), Lake Erie, New York.*—Changed, June 1, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 57 seconds.

*Avery Rock, Machias Bay, Maine.*—Changed, June 20, 1895, from a blow every 11 seconds to a blow every 10 seconds.

*Pond Island, mouth of the Kennebec River, Maine.*—Changed, June 20, 1895, from a blow every  $8\frac{1}{2}$  seconds to a blow every 10 seconds.

#### CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

*Grand Haven Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 6, 1894, 278 feet nearer the outer end of the south pier.

*New Channel range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 320 feet NNW.  $\frac{3}{8}$  W., from its former position.

*New Channel range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 350 feet NNW.  $\frac{1}{4}$  W., from its former position.

*Smith Island range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 1,600 feet W.  $\frac{5}{8}$  N. from its former position.

*Smith Island range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 2,100 feet NW.  $\frac{1}{8}$  W. from its former position.

*Muskegon Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 20, 1894, 323 feet nearer the outer end of the south pier.

ALASKA

100 NAUTICAL  
100

200

170°

180°

180°



# REPORT OF THE UNITED STATES LIGHT-HOUSE BOARD.

TREASURY DEPARTMENT,  
OFFICE OF THE LIGHT-HOUSE BOARD,  
*Washington, D. C., November 9, 1895.*

SIR: The Light-House Board has the honor to submit, for your information and that of Congress, the following report of the work done under its direction during the fiscal year which ended on June 30, 1895.

At the close of the year there were under the control of the Light-House Establishment the following-named aids to navigation:

Light-houses and beacon lights.....	1, 014
Light-ships in position.....	41
Light-ships for relief.....	4
Electric-lighted buoys in position.....	11
Gas buoys in position.....	12
Fog signals operated by steam or caloric engines.....	130
Fog signals operated by clockwork.....	185
Post lights on the Western rivers.....	1, 411
Post lights on other rivers.....	382
Day or unlighted beacons.....	424
Whistling buoys in position.....	66
Bell buoys in position.....	96
Other buoys in position, including pile buoys and stakes in Fifth district and buoys in Alaskan waters.....	4, 547

In the construction, care, and maintenance of these aids to navigation there were employed—

Steam tenders .....	32
Steam launches .....	4
Sailing tenders .....	2
Light keepers .....	1, 203
Other employees, including crews of light-ships and tenders.....	1, 078
Laborers in charge of Western river lights.....	1, 154
Laborers in charge of other river post lights.....	210

## NEW LIGHTS.

The following-named new lights were established during the fiscal year:

*Grosse Isle North Channel range, Detroit River, Michigan.*—Two lens-lantern lights, July 16, 1894.

*Mamajuda range (front), Detroit River, Michigan.*—A lens-lantern light, July 16, 1894.

*Rabbit Island post light, Grand Lake, Louisiana.*—A tubular-lantern light, August 9, 1894.

*Pillar Rock post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Martin Island post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Wolf Trap, Chesapeake Bay, Virginia.*—A fourth-order light, September 20, 1894.

*Prescott Landing post light, Columbia River, Oregon.*—A tubular-lantern light, September 26, 1894.

*Boston light-vessel, No. 51, off the entrance to Boston Harbor, Massachusetts.*—Two reflector lights, October 1, 1894.

*Rockland Lake, Hudson River, New York.*—A fourth-order light, October 1, 1894.

*Churchville Point, St. Marys River, Michigan.*—A lens-lantern light, October 1, 1894.

*Pilot Island range, St. Marys River, Michigan.*—Two lens-lantern lights, October 15, 1894.

*Fourteen-Mile Point, Lake Superior, Michigan.*—A fourth-order light, October 15, 1894.

*Waackaack, New York Bay, New Jersey.*—An additional range light, October 25, 1894.

*Bristol Ferry, Mount Hope Bay, Rhode Island.*—A sixth-order light (reestablished), November 5, 1894.

*South Pass light-vessel, Gulf of Mexico, Louisiana.*—A reflector light, November 5, 1894.

*Portage River range, Portage River, Michigan.*—Two tubular-lantern lights, November 15, 1894.

*Portage Lake Ship Canal, Portage Lake, Michigan.*—Two tubular-lantern lights, November 15, 1894.

*Semiahmoo post light, Semiahmoo Bay, Washington.*—A tubular-lantern light, December 1, 1894.

*New Cut range, Cape Fear River, North Carolina.*—Two lantern lights, December 13, 1894.

*Oak Bluff post light, East River, New York.*—A double-lantern light, December 25, 1894.

*Sullivan's Island Breakwater beacon, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.

- Moultrieville beacon, No. 2, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Mount Pleasant beacon, No. 6, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- East side of Channel beacon, No. 4, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Hog Island beacon, No. 1, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Shutes Folly Island Spit beacon, No. 3, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Umpqua River, seacoast of Oregon.*—A first-order light, December 31, 1894.
- Saxnholm post light, Mississippi River, Louisiana.*—A tubular-lantern light, January 1, 1895.
- St. Philips Bend post light, Mississippi River, Louisiana.*—A tubular-lantern light, January 14, 1895.
- Grand Liard Bayou, Mississippi River, Louisiana.*—A tubular-lantern light, January 14, 1895.
- Orchard Point post light, Puget Sound, Washington.*—A tubular-lantern light, January 15, 1895.
- Pine Island beacon, Stamford Harbor, Connecticut.*—A lantern light, January 20, 1895.
- Sands Point, Long Island Sound, New York.*—A fourth-order light (reestablished), January 21, 1895.
- Indian Hill, Tampa Bay, Florida.*—A lens-lantern light, January 25, 1895.
- South Cut, Tampa Bay, Florida.*—A lens-lantern light, January 26, 1895.
- North Cut, Tampa Bay, Florida.*—A lens-lantern light, January 28, 1895.
- Long Shoal, Tampa Bay, Florida.*—A lens-lantern light, January 29, 1895.
- Middle Ground, Tampa Bay, Florida.*—A lens-lantern light, January 29, 1895.
- Barrel Stake, Tampa Bay, Florida.*—A lens-lantern light, January 29, 1895.
- Mullet Key Shoal, Tampa Bay, Florida.*—A lens-lantern light, January 30, 1895.
- Barrel Stake post light, No. 20 $\frac{1}{2}$ , Indian River, Florida.*—A lantern light, January 31, 1895.
- Burnetts Canal post light, No. 20 $\frac{1}{2}$ , Indian River, Florida.*—A lantern light, January 31, 1895.
- Long Canal post light, No. 40, Indian River, Florida.*—A lantern light, January 31, 1895.
- Sand Island range (rear), entrance to Mobile Bay, Alabama.*—A reflector light, February 1, 1895.

*Barlow Point range (rear) post light, Columbia River, Washington.*—A tubular-lantern light, February 8, 1895.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Two lens-lantern lights, March 6, 1895.

*Yaquina Bar range beacons, entrance to Yaquina Bay, Oregon.*—A lens-lantern and a tubular-lantern light, March 7, 1895.

*Government Wharf beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.

*Middle Ground beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.

*Grassy Island Ledge beacon, Woods Hole, Massachusetts.*—A lens-lantern light, March 31, 1895.

*Middle Ledge beacon, Woods Hole, Massachusetts.*—A double lens-lantern light, March 31, 1895.

*Manhattan range, Maumee Bay, Ohio.*—Two sixth-order lights, April 1, 1895.

*South Boston range, Boston Harbor, Massachusetts.*—A double and a single lens-lantern light, April 15, 1895.

*Mandarin Point post light, St. Johns River, Florida.*—A lantern light, May 10, 1895.

*Muskegon Lake beacon, Lake Michigan, Michigan.*—A lantern light, May 10, 1895.

*St. Simon range (front), entrance to St. Simon Sound, Georgia.*—A reflector light, May 15, 1895.

*Carrabelle River Bar range beacons, St. George Sound, Florida.*—Two lantern lights, May 25, 1895.

*Timber Island beacon, Carrabelle River, Florida.*—A lantern light, May 25, 1895.

*Sitka Harbor, Alaska.*—A tubular-lantern light, June 20, 1895.

#### NEW FOG SIGNALS.

During the fiscal year fog signals were established at the following-named existing light-stations:

*Hudson City, Hudson River, New York.*—A bell struck by machinery, July 15, 1894.

*Wolf Trap, Chesapeake Bay, Virginia.*—A bell struck by hand, September 20, 1894.

*Ludington Pierhead range, Lake Michigan, Michigan.*—A 10-inch steam whistle, January 31, 1895.

*Kewaunee Pierhead, Lake Michigan, Wisconsin.*—A 10-inch steam whistle, January 31, 1895.

*Smith Point light-vessel, No. 46, Chesapeake Bay, Virginia.*—A 12-inch steam whistle, June 8, 1895.

During the fiscal year an auxiliary fog signal was established at the following-named fog-signal station:

*Cuckolds, off the entrance to Boothbay, Maine.*—A 1,000-pound bell, April 15, 1895.

The following-named new fog signals were established during the fiscal year:

*Boston light-vessel, No. 54, off the entrance to Boston Harbor, Massachusetts.*—A 12-inch steam chime whistle, October 1, 1894.

*Fourteen-Mile Point Lake Superior, Michigan.*—A 10-inch steam whistle, October 15, 1894.

#### LIGHTS DISCONTINUED.

The following-named lights were, in the course of the last fiscal year, discontinued:

*Oak Island range, entrance to Cape Fear River, North Carolina.*—A tubular-lantern and a fourth-order light, July 31, 1894.

*Shaws Island post light, Grand Lake, Louisiana.*—A tubular-lantern light, August 8, 1894.

*Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A reflector light, August 15, 1894.

*Mid-Channel post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Martin Island range post lights, Columbia River, Washington.*—Two tubular-lantern lights, September 8, 1894.

*Wolf Trap Shoal light-vessel, No. 46, Chesapeake Bay, Virginia.*—Two reflector lights, September 20, 1894.

*Marquette Breakwater, Lake Superior, Michigan.*—A lantern light, October 1, 1894.

*Bristol Ferry, Mount Hope Bay, Rhode Island.*—A sixth-order light, October 30, 1894. (Reestablished November 5, 1894.)

*Sands Point, Long Island Sound, New York.*—A fourth-order light, October 31, 1894. (Reestablished January 21, 1895.)

*Kewaunee Pierhead range (front), Lake Michigan, Wisconsin.*—A tubular-lantern light, November 2, 1894.

*Rock Island, St. Lawrence River, New York.*—A reflector light, close of navigation, 1894.

*Twelve-Mile Point post light, Mississippi River, Louisiana.*—A tubular-lantern light, December 31, 1894.

*Jones Point post light, No. 6, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Eau Gallie post light, No. 12, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Grant Farm (upper) post light, No. 9 $\frac{3}{4}$ , Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

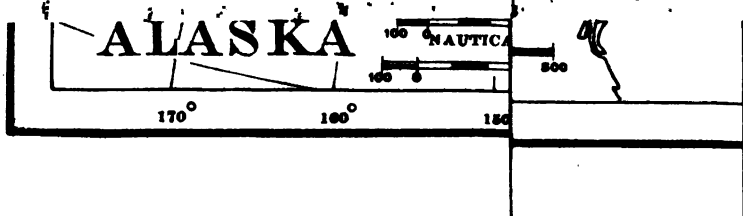
*Peck Lake, North, post light, No. 26, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Peck Lake, South, post light, No. 28, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*South Narrows post light, No. 32, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.









# R E P O R T

## O F

### THE UNITED STATES LIGHT-HOUSE BOARD.

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TREASURY DEPARTMENT,  
OFFICE OF THE LIGHT-HOUSE BOARD,  
*Washington, D. C., November 9, 1895.*

SIR: The Light-House Board has the honor to submit, for your information and that of Congress, the following report of the work done under its direction during the fiscal year which ended on June 30, 1895.

At the close of the year there were under the control of the Light-House Establishment the following-named aids to navigation:

Light-houses and beacon lights.....	1,014
Light-ships in position.....	41
Light-ships for relief.....	4
Electric-lighted buoys in position.....	11
Gas buoys in position.....	12
Fog signals operated by steam or calorific engines.....	130
Fog signals operated by clockwork.....	185
Post lights on the Western rivers.....	1,411
Post lights on other rivers.....	382
Day or unlighted beacons.....	424
Whistling buoys in position.....	66
Bell buoys in position.....	96
Other buoys in position, including pile buoys and stakes in Fifth district and buoys in Alaskan waters.....	4,547

In the construction, care, and maintenance of these aids to navigation there were employed—

Steam tenders .....	32
Steam launches .....	4
Sailing tenders .....	2
Light keepers .....	1,203
Other employees, including crews of light-ships and tenders.....	1,078
Laborers in charge of Western river lights.....	1,154
Laborers in charge of other river post lights.....	210

## NEW LIGHTS.

The following-named new lights were established during the fiscal year:

*Grosse Isle North Channel range, Detroit River, Michigan.*—Two lens-lantern lights, July 16, 1894.

*Mamajuda range (front), Detroit River, Michigan.*—A lens-lantern light, July 16, 1894.

*Rabbit Island post light, Grand Lake, Louisiana.*—A tubular-lantern light, August 9, 1894.

*Pillar Rock post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Martin Island post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Wolf Trap, Chesapeake Bay, Virginia.*—A fourth-order light, September 20, 1894.

*Prescott Landing post light, Columbia River, Oregon.*—A tubular-lantern light, September 26, 1894.

*Boston light-vessel, No. 54, off the entrance to Boston Harbor, Massachusetts.*—Two reflector lights, October 1, 1894.

*Rockland Lake, Hudson River, New York.*—A fourth-order light, October 1, 1894.

*Churchville Point, St. Marys River, Michigan.*—A lens-lantern light, October 1, 1894.

*Pilot Island range, St. Marys River, Michigan.*—Two lens-lantern lights, October 15, 1894.

*Fourteen-Mile Point, Lake Superior, Michigan.*—A fourth-order light, October 15, 1894.

*Waackaack, New York Bay, New Jersey.*—An additional range light, October 25, 1894.

*Bristol Ferry, Mount Hope Bay, Rhode Island.*—A sixth-order light (reestablished), November 5, 1894.

*South Pass light-vessel, Gulf of Mexico, Louisiana.*—A reflector light, November 5, 1894.

*Portage River range, Portage River, Michigan.*—Two tubular-lantern lights, November 15, 1894.

*Portage Lake Ship Canal, Portage Lake, Michigan.*—Two tubular-lantern lights, November 15, 1894.

*Semiahmoo post light, Semiahmoo Bay, Washington.*—A tubular-lantern light, December 1, 1894.

*New Cut range, Cape Fear River, North Carolina.*—Two lantern lights, December 13, 1894.

*Oak Bluff post light, East River, New York.*—A double-lantern light, December 25, 1894.

*Sullivan's Island Breakwater beacon, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.

- Moultrieville beacon, No. 2, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Mount Pleasant beacon, No. 6, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- East side of Channel beacon, No. 4, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Hog Island beacon, No. 1, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Shutes Folly Island Spit beacon, No. 3, Charleston Harbor, South Carolina.*—A lantern light, December 31, 1894.
- Umpqua River, seacoast of Oregon.*—A first-order light, December 31, 1894.
- Saxnoholm post light, Mississippi River, Louisiana.*—A tubular-lantern light, January 1, 1895.
- St. Philips Bend post light, Mississippi River, Louisiana.*—A tubular-lantern light, January 14, 1895.
- Grand Liard Bayou, Mississippi River, Louisiana.*—A tubular-lantern light, January 14, 1895.
- Orchard Point post light, Puget Sound, Washington.*—A tubular-lantern light, January 15, 1895.
- Pine Island beacon, Stamford Harbor, Connecticut.*—A lantern light, January 20, 1895.
- Sands Point, Long Island Sound, New York.*—A fourth-order light (reestablished), January 21, 1895.
- Indian Hill, Tampa Bay, Florida.*—A lens-lantern light, January 25, 1895.
- South Cut, Tampa Bay, Florida.*—A lens-lantern light, January 26, 1895.
- North Cut, Tampa Bay, Florida.*—A lens-lantern light, January 28, 1895.
- Long Shoal, Tampa Bay, Florida.*—A lens-lantern light, January 29, 1895.
- Middle Ground, Tampa Bay, Florida.*—A lens-lantern light, January 29, 1895.
- Barrel Stake, Tampa Bay, Florida.*—A lens-lantern light, January 29, 1895.
- Mullet Key Shoal, Tampa Bay, Florida.*—A lens-lantern light, January 30, 1895.
- Barrel Stake post light, No. 20½, Indian River, Florida.*—A lantern light, January 31, 1895.
- Burnetts Canal post light, No. 20½, Indian River, Florida.*—A lantern light, January 31, 1895.
- Long Canal post light, No. 40, Indian River, Florida.*—A lantern light, January 31, 1895.
- Sand Island range (rear), entrance to Mobile Bay, Alabama.*—A reflector light, February 1, 1895.

- Barlow Point range (rear) post light, Columbia River, Washington.*—A tubular-lantern light, February 8, 1895.
- Smith Point light-vessel, Chesapeake Bay, Virginia.*—Two lens-lantern lights, March 6, 1895.
- Yaquina Bar range beacons, entrance to Yaquina Bay, Oregon.*—A lens-lantern and a tubular-lantern light, March 7, 1895.
- Government Wharf beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.
- Middle Ground beacon, Yaquina Bay, Oregon.*—A tubular-lantern light, March 7, 1895.
- Grassy Island Ledge beacon, Woods Hole, Massachusetts.*—A lens-lantern light, March 31, 1895.
- Middle Ledge beacon, Woods Hole, Massachusetts.*—A double lens-lantern light, March 31, 1895.
- Manhattan range, Maumee Bay, Ohio.*—Two sixth-order lights, April 1, 1895.
- South Boston range, Boston Harbor, Massachusetts.*—A double and a single lens-lantern light, April 15, 1895.
- Mandarin Point post light, St. Johns River, Florida.*—A lantern light, May 10, 1895.
- Muskegon Lake beacon, Lake Michigan, Michigan.*—A lantern light, May 10, 1895.
- St. Simon range (front), entrance to St. Simon Sound, Georgia.*—A reflector light, May 15, 1895.
- Carrabelle River Bar range beacons, St. George Sound, Florida.*—Two lantern lights, May 25, 1895.
- Timber Island beacon, Carrabelle River, Florida.*—A lantern light, May 25, 1895.
- Sitka Harbor, Alaska.*—A tubular-lantern light, June 20, 1895.

## NEW FOG SIGNALS.

During the fiscal year fog signals were established at the following-named existing light-stations:

- Hudson City, Hudson River, New York.*—A bell struck by machinery, July 15, 1894.
- Wolf Trap, Chesapeake Bay, Virginia.*—A bell struck by hand, September 20, 1894.
- Ludington Pierhead range, Lake Michigan, Michigan.*—A 10-inch steam whistle, January 31, 1895.
- Kewaunee Pierhead, Lake Michigan, Wisconsin.*—A 10-inch steam whistle, January 31, 1895.
- Smith Point light-vessel, No. 46, Chesapeake Bay, Virginia.*—A 12-inch steam whistle, June 8, 1895.

During the fiscal year an auxiliary fog signal was established at the following-named fog-signal station:

- Cuckolds, off the entrance to Boothbay, Maine.*—A 1,000-pound bell, April 15, 1895.

The following-named new fog signals were established during the fiscal year:

*Boston light-vessel, No. 54, off the entrance to Boston Harbor, Massachusetts.*—A 12-inch steam chime whistle, October 1, 1894.

*Fourteen-Mile Point Lake Superior, Michigan.*—A 10-inch steam whistle, October 15, 1894.

#### LIGHTS DISCONTINUED.

The following-named lights were, in the course of the last fiscal year, discontinued:

*Oak Island range, entrance to Cape Fear River, North Carolina.*—A tubular-lantern and a fourth-order light, July 31, 1894.

*Shaws Island post light, Grand Lake, Louisiana.*—A tubular-lantern light, August 8, 1894.

*Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A reflector light, August 15, 1894.

*Mid-Channel post light, Columbia River, Washington.*—A tubular-lantern light, September 8, 1894.

*Martin Island range post lights, Columbia River, Washington.*—Two tubular-lantern lights, September 8, 1894.

*Wolf Trap Shoal light-vessel, No. 46, Chesapeake Bay, Virginia.*—Two reflector lights, September 20, 1894.

*Marquette Breakwater, Lake Superior, Michigan.*—A lantern light, October 1, 1894.

*Bristol Ferry, Mount Hope Bay, Rhode Island.*—A sixth-order light, October 30, 1894. (Reestablished November 5, 1894.)

*Sands Point, Long Island Sound, New York.*—A fourth-order light, October 31, 1894. (Reestablished January 21, 1895.)

*Kewaunee Pierhead range (front), Lake Michigan, Wisconsin.*—A tubular-lantern light, November 2, 1894.

*Rock Island, St. Lawrence River, New York.*—A reflector light, close of navigation, 1894.

*Twelve-Mile Point post light, Mississippi River, Louisiana.*—A tubular-lantern light, December 31, 1894.

*Jones Point post light, No. 6, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Eau Gallie post light, No. 12, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Grant Farm (upper) post light, No. 9 $\frac{3}{4}$ , Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Peck Lake, North, post light, No. 26, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Peck Lake, South, post light, No. 28, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*South Narrows post light, No. 32, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

- Conch Bar post light, No. 36, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.
- Solomons Lump, Chesapeake Bay, Maryland.*—A lens-lantern light, February 22, 1895. (Wreck of structure carried away by ice.)
- Venus Point range (front), entrance to Savannah River, South Carolina.*—A reflector light, March 18, 1895.
- Maumee outer range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Maumee middle range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Maumee inner range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.
- Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—A lantern light, May 4, 1895.
- Orange Park post light, No. 38, St. Johns River, Florida.*—A tubular-lantern light, May 10, 1895.

## FOG SIGNAL DISCONTINUED.

During the fiscal year the following-named fog signal was discontinued:

- Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A 12-inch steam whistle, August 15, 1894.

## CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

- Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—Changed July 6, 1894, from a tubular-lantern to a lantern light.
- New Channel range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from tubular-lantern to lens-lantern lights. Height of front and rear lights increased, respectively, to 20 feet and 38 feet.
- Smith Island range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from lens-lantern to lantern lights. Height of front and rear lights increased, respectively, 2 feet and 3 feet.
- Maumee Bay ranges, Maumee Bay, Ohio.*—Luminous intensity of lights increased July 20, 1894, by changing the front and east lights from reflector to lens-lantern lights, and the west light from a reflector to a lantern light.
- Muskegon Pierhead range (front), Lake Michigan, Michigan.*—Changed July 21, 1894, from a tubular-lantern light to a lantern light.
- Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Changed from light-vessel No. 54 to light-vessel No. 58, July 26, 1894.

- Barlow Point post light, Columbia River, Washington.*—Changed September 8, 1894, from a cluster of piles to an arm on a tree.
- La Du post light, Columbia River, Washington.*—Changed from fixed red to fixed white, September 8, 1894.
- St. Helens Jetty post light, Columbia River, Washington.*—Changed from fixed red to fixed white, and from a framework to a gallows frame, September 8, 1894.
- Cherry Island range (front), Delaware River, Delaware.*—Changed September 20, 1894, from fixed to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Waackaack (main channel range, rear), New York Bay, New Jersey.*—Changed to a new structure, height increased from 76 to 101½ feet, and luminous intensity increased by changing to a second-order range lens, October 25, 1894.
- Finns Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- New Castle range (front) Delaware River, Delaware.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Deep Water Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Schooner Ledge range (front), Delaware River, Pennsylvania.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Billingsport range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Rock Island, St. Lawrence River, New York.*—Height increased to 45 feet in October, 1894.
- Beacon 1 post light, Columbia River, Oregon.*—Changed December 1, 1894, from red to white.
- Sandy Hook light-vessel, entrance to New York Bay, New York.*—Changed from light-vessel No. 48 to light-vessel No. 51; characteristic changed from one flashing red and one fixed red reflector light to one fixed white electric light, shown simultaneously from a group of four lens lanterns, during periods of 12 seconds' duration separated by an eclipse of 3 seconds' duration; height increased from 37 feet to 54 feet, December 5, 1894.
- Scotland light-vessel, No. 7, entrance to New York Bay, New Jersey.*—Changed December 5, 1894, from two fixed white to two fixed red lights.
- Ram Island Reef light-vessel, Fishers Island Sound, New York.*—Changed December 8, 1894, from light-vessel No. 19 to light-vessel No. 23, having a red instead of a straw-colored hull, and black instead of red day marks at the mastheads.

*Execution Rocks, Long Island Sound, New York.*—The easterly edge of the red sector was corrected December 8, 1894, to bear NE.  $\frac{1}{4}$  N. and guide clear of the south end of Hart Island.

*Coon Island post light, entrance to the Willamette River, Oregon.*—Changed December 18, 1894, from red to white.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from light-vessel No. 20, temporarily marking the station, to light-vessel No. 48; characteristic changed to two reflector lights, the one on the foremast showing a white flash every 30 seconds, and that on the mainmast showing fixed red; height decreased from 54 feet to 37 feet, January 15, 1895.

*Muskegon Pierhead, Lake Michigan, Michigan.*—Changed, January 16, 1895, to illuminate the entire horizon.

*Grant Farm (lower) post light, Indian River, Florida.*—Changed from white to red, the color of its day mark from black to red, and its number to 14 $\frac{1}{2}$ , January 31, 1895.

*Port Penn range (front), Delaware River, Delaware.*—Changed February 14, 1895, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed February 28, 1895, from fixed white varied by a white flash every 10 seconds, to fixed white varied by a white flash every 25 seconds.

*Cubits Gap post light, Mississippi River, Louisiana.*—Changed from fixed white to fixed red, March 1, 1895.

*Waackaack, New York Bay, New Jersey.*—Changed by the substitution of a third-order for the first-order lamp in each of the two range lenses, April 18, 1895.

*Sand Spit, Hudson River, New York.*—Exhibited from a new structure, a dolphin of five piles, May 2, 1895.

*Ahnapee Pierhead range (rear), Lake Michigan, Wisconsin.*—Changed, June 6, 1895, from a lens-lantern to a fifth-order light.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Changed, June 8, 1895, from the schooner *Drift* to light-vessel No. 46, from two lens-lantern to two reflector lights, and from 57 to 45 feet in height.

*Yaquina Bar range (rear) beacon, Yaquina Bay, Oregon.*—Height increased to 30 $\frac{1}{4}$  feet, June 18, 1895.

*Mahon River, Delaware Bay, Delaware.*—Changed, June 29, 1895, from fixed white to fixed white with a narrow fixed red sector between S. 26° 15' W. (SSW.  $\frac{3}{4}$  W.) and S. 31° 25' W. (SSW.  $\frac{1}{2}$  W.).

#### CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in fog signals:

*North Hook beacon, Sandy Hook, New Jersey.*—The characteristic of the siren was changed, November 30, 1894, to sound blasts of 3 seconds, separated by silent intervals of 27 seconds' duration.



*Sandy Hook light-vessel, entrance to New York Bay, New York.*—The 12-inch steam whistle was changed, December 5, 1894, to sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed, January 7, 1895, from a bell struck by hand to a Daboll trumpet sounding blasts of 3 seconds' duration, separated by silent intervals of 7 seconds.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from a 12-inch to a 10-inch steam whistle, and from blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, to blasts of 3 seconds' duration, separated by alternate silent intervals of 1 second and 30 seconds, January 15, 1895.

*St. George Reef, off the seacoast of California.*—Changed, March 1, 1895, to sound blasts of 5 seconds' duration, separated by silent intervals of 75 seconds.

*Fort Gratiot, Lake Huron, Michigan.*—Changed, April 8, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 17 seconds.

*Buffalo Breakwater (north end), Lake Erie, New York.*—Changed, June 1, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 57 seconds.

*Avery Rock, Machias Bay, Maine.*—Changed, June 20, 1895, from a blow every 11 seconds to a blow every 10 seconds.

*Pond Island, mouth of the Kennebec River, Maine.*—Changed, June 20, 1895, from a blow every  $8\frac{1}{2}$  seconds to a blow every 10 seconds.

#### CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

*Grand Haven Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 6, 1894, 278 feet nearer the outer end of the south pier.

*New Channel range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 320 feet NNW.  $\frac{3}{8}$  W., from its former position.

*New Channel range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 350 feet NNW.  $\frac{1}{4}$  W., from its former position.

*Smith Island range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 1,600 feet W.  $\frac{5}{8}$  N. from its former position.

*Smith Island range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 2,100 feet NW.  $\frac{1}{8}$  W. from its former position.

*Muskegon Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 20, 1894, 323 feet nearer the outer end of the south pier.

- Cape Canaveral light, seacoast of Florida.*—Moved, July 25, 1894, 5,200 feet S.  $87^{\circ} 24'$  W. (W.  $\frac{1}{4}$  S.) from its former position.
- Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Moved, July 26, 1894, a little to the southward and westward.
- Northeast End light-vessel No. 44, off the seacoast of New Jersey.*—Moved, September 1, 1894, about 2 miles E.  $\frac{3}{4}$  S. from her former moorings.
- Five-Fathom Bank light-vessel No. 40, off the seacoast of New Jersey.*—Moved, September 1, 1894, about  $1\frac{3}{4}$  miles SE. by S. from her former moorings.
- Barlow Point post light, Columbia River, Washington.*—Moved, September 8, 1894, about 1,400 feet WNW. from its former position.
- Scotch Cap post light, Thames River, Connecticut.*—Moved, September 10, 1894, from the west bank of the river S. by E. to a location in 6 feet of water.
- Marquette Breakwater light, Lake Superior, Michigan.*—Moved, October 1, 1894, about 1,000 feet to the outer end of the extended breakwater.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 7, 1894, northwesterly, along the range line, 20 feet from its former position.
- Waackaack (main channel range, rear) light, New York Bay, New Jersey.*—Moved, October 25, 1894, 52 feet westerly, along the main channel range, to the position occupied previous to November, 1892.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 29, 1894, northwesterly, along the range line, 20 feet from its former position.
- Fort Mifflin fog signal, Delaware River, Pennsylvania.*—Moved, November 19, 1894, from the dock to the parapet back of the dock at Fort Mifflin.
- Kewaunee Pierhead range (rear) light, Lake Michigan, Wisconsin.*—Moved November 2, 1894, 300 feet nearer the outer end of the north pier.
- Winter Point range (rear) light, St. Marys River, Michigan.*—Moved, November 3, 1894, to a point on the westerly prolongation of the range line 675 feet in rear of the front light.
- Twin River Point light, Lake Michigan, Wisconsin.*—Moved November 19, 1894, to a new tower, located 47 feet S.  $68^{\circ} 30'$  W. (WSW.  $\frac{1}{4}$  W.) from the former tower.
- Salisbury Beach range lights, entrance to Newburyport Harbor, Massachusetts.*—Moved, November 20, 1894, about one-fourth mile NNE. from their former location, to mark the line of best water across the bar.

*Beacon 1 post light, Columbia River, Oregon.*—Moved, December 1, 1894, into 14 feet of water about five-eighths mile westerly from its former position.

*South Pass light-vessel, No. 43, off South Pass, entrance to the Mississippi River, Louisiana.*—Moved, December 3, 1894, into 82 feet of water about 1 mile NE. from her former moorings.

*Cubits Gap post light, Mississippi River, Louisiana.*—Moved, January 1, 1895, about one-third mile up the river and exhibited from the fog-bell tower at a height of 35 feet.

*Smith Point post light, Columbia River, Oregon.*—Moved, January 1, 1895, to a stake on the railway trestle off the point.

*Micco post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure about 1 mile to the southward and eastward of Grant Farm.

*St. Lucie post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure nearly five-eighths mile W.  $\frac{1}{2}$  N. from its former location.

*North Narrows post light, Indian River, Florida.*—Moved, January 31, 1895, about three-eighths mile NNW. of its former location.

*Barlow Point range (front) post light, Columbia River, Washington.*—Moved, February 8, 1895, to a new structure.

*Fairport Pierhead range (front) light, Lake Erie, Ohio.*—Moved, February 1, 1895, 122 feet to the southward of its former location.

*Grosse Isle South Channel range lights, Detroit River, Michigan.*—On March 30, 1895, the front and rear lights of this range were reestablished, each in a new structure, and the heights changed, respectively, to 30 feet and 50 feet above the level of the river.

*Lake Huron light-vessel, No. 61, off the entrance to the St. Clair River, Michigan.*—Moved, on the opening of navigation 1895, to a position 9,125 feet N.  $19^{\circ} 53'$  E. (N.  $\frac{3}{4}$  E.) from Fort Gratiot light-house.

*Grand Haven Pierhead light, Lake Michigan, Michigan.*—Moved, May 4, 1895, 511 feet nearer the outer end of the south pier.

#### NEW BUOYS.

During the fiscal year the following-named special buoys were established:

*Trinity Shoal, Gulf coast of Louisiana.*—A bell buoy, August 15, 1894.

*Lloyd Point, Shoal, off Lloyd Neck, Long Island Sound, New York.*—A bell buoy, September 13, 1894.

*Sewell Point, Hampton Roads, Virginia.*—A bell buoy, September 19, 1894.

*Baker Shoal, Delaware River, New Jersey.*—A gas-lighted buoy, September 29, 1894.

*Bishop Rock Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, October 19, 1894.

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Staniford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Break-water light-station.

## BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

## TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.

- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.

*Cape San Blas light, Gulf coast of Florida.*—Extinguished during the gale of October 8 and 9, 1894, owing to the undermining of the tower and carrying away of part of the station.

*Cornfield Point light-vessel, No. 51, Long Island Sound, Connecticut.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 20, showing a fixed white reflector light instead of an occulting electric light, and sounding a bell struck by hand instead of a steam fog signal, November 8, 1894. Relief light-vessel No. 20 broke adrift from her moorings November 16, and was replaced November 21, 1894. Light-vessel No. 20 withdrawn and permanently replaced by light-vessel No. 48, January 15, 1895. Steam fog signal disabled and bell struck by hand January 26, 1895. Steam fog signal repaired and put into operation February 17, 1895.

*Point Conception light-station, seacoast of California.*—Characteristic of fog signal modified owing to scarcity of water November 8, 1894. Characteristic of signal reestablished December 13, 1894.

*Key West light-station, Florida.*—Third-order light extinguished and lens-lantern light, without red sectors, substituted November 30, 1894, to remain during the work of increasing height of tower. Third-order light with red sectors reestablished and temporary light extinguished February 5, 1895.

*Bar Point light-vessel, No. 59, mouth of Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 9, 1895.

*Limekiln Crossing light-vessel (south), No. 64, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Limekiln Crossing light-vessel (north), No. 65, Detroit River Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Ballard Reef light-vessel, No. 63, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Lake Huron light-vessel, No. 61, Lake Huron, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April, 1895.

*Poe Reef light-vessel, No. 62, easterly entrance to the Straits of Mackinac, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 21, 1895.

*Simmons Reef light-vessel, No. 55, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 10, 1894. Replaced April 24, 1895.

*White Shoal light-vessel, No. 56, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.

- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

*Long Reach (upper) post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and light reestablished April 3, 1895.

*Pride Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 3; rebuilt and light reestablished April 3, 1895.

*Burnt House Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 8; rebuilt and light reestablished April 3, 1895.

*Execution Rocks light-station, westerly end of Long Island Sound, New York.*—Fog signal disabled and discontinued from March 9 to March 28, 1895.

*Nine-Mile Point post light, St. Johns River, Florida.*—Structure destroyed by fire and light shown from temporary stake March 25; structure rebuilt and light reestablished as before April 22, 1895.

*Hell Gate post light, East River, New York.*—Characteristic changed to fixed red above fixed white March 30; former characteristic restored April 18, 1895.

*Mouse Island (lower) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.

*Mouse Island (upper) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—A gas-lighted buoy was established on either side of the mouth of the dredged channel April 4. West side buoy moved about 2 miles to southward and placed on east side of channel and east side buoy moved about 1 mile to southward May 15, 1895.

*Bath Dike post light, Hudson River, New York.*—Structure carried away by a freshet and light extinguished April 9; structure rebuilt and light reestablished April 11, 1895.

*Pleasure Island post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.

*Covells Folly post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.

*Green Flats post light, Hudson River, New York.*—Structure destroyed by freshet and light extinguished April 9; rebuilt and light reestablished May 1, 1895.

*Colt Pier range (front) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.

*Colt Pier range (rear) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.



*Sand Spit beacon light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 29, 1895.

*Roha Hook post light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 27, 1895.

*Nashua post light, St. Johns River, Florida.*—Structure knocked down by a tow and light extinguished April 10; light on temporary stake April 11; structure rebuilt and light reestablished as before April 21, 1895.

*East Haddam Meadows post light, Connecticut River, Connecticut.*—Discontinued from April 15 to April 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—Twenty-six lights established April 15 to remain one calendar month. Lights reestablished May 15, 1895, to remain until permanent system is established. Two additional temporary lights established May 16.

*Dog River Bar beacon light No. 1, Mobile Bay, Alabama.*—Changed from fixed red to fixed white April 15, 1895, to remain so during the existence of the temporary system of lighting Mobile Bay Dredged Channel.

*Choctaw Pass Channel range (rear) beacon No. 3, Mobile Bay, Alabama.*—Discontinued from April 15 to May 4, 1895.

*Press Barn Bar range (front) post light, Connecticut River Connecticut.*—Discontinued from April 17 to May 20, 1895, on account of the heavy freshets.

*Gedney and Bayside Range Cut Channels, entrance to New York Lower Bay, New York and New Jersey.*—An experimental system of ten electrically lighted spar buoys was established and operated during daylight from May 2 to July 1, 1895. At night the buoys were lighted with oil lanterns.

*Delaware Breakwater (east end) light-station, entrance to Delaware Bay, Delaware.*—The fog signal at this station was disabled from May 5 to May 9, 1895.

*South Pass light-vessel, No. 43, off South Pass entrance to the Mississippi River, Louisiana.*—Withdrawn from her station for the summer months May 18, 1895.

*Wreck of the Kate Kelly light, Lake Michigan, Michigan.*—A white lantern light established June 15, 1895. (Discontinued October 11, 1895.)

*Martins Industry light-vessel, No. 1, off Port Royal entrance, South Carolina.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 29, sounding a bell struck by hand instead of a steam fog signal, June 20, 1895. (Relief light-vessel No. 29 withdrawn and light-vessel No. 1 replaced August 20, 1895.)

*Beacon light, No. 9, North River, North Carolina.*—Structure knocked down by a passing vessel and light extinguished June 21, 1895. (Rebuilt and light reestablished September 27, 1895.)

*Marblehead light-station, entrance to Marblehead Harbor, Massachusetts.*—Light moved to a temporary tower June 22, 1895, to make place for the erection of a new tower.

*Sandy Hook light-vessel, No. 51, off the entrance to New York Lower Bay, New York.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 16, showing a fixed white reflector light instead of an occulting electric light, June 24, 1895. (Relief light-vessel withdrawn and light-vessel No. 51 replaced July 3, 1895.)

*Brant Point light, entrance to Nantucket Harbor, Massachusetts.*—Changed from a fourth-order to a lens-lantern light on the nights of June 24 and 25, 1895.

*Aids to navigation maintained by the Light-House Board, June 30, 1895.*

Aids.	First district.	Second district.	Third district.	Fourth district.	Fifth district.	Sixth district.	Seventh district.	Eighth district.	Ninth district.	Tenth district.	Eleventh district.	Twelfth district.	Thirteenth district.	Fourteenth district.	Fifteenth district.	Sixteenth district.	Atlantic coast.	Pacific coast.	Lake coast.	Western rivers.	Total entire coast, 1894.	Total entire coast, 1895.	Increase or decrease.
Electric lights.....	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
First-order lights.....	2	4	6	5	6	7	8	2	1	6	2	9	9	9	9	9	40	18	18	18	56	56	56
Second-order lights.....	7	3	1	1	1	1	1	3	8	6	8	3	3	3	3	3	15	1	1	1	19	19	19
Third-order lights.....	6	1	5	3	1	4	5	3	1	1	1	1	1	1	1	1	27	4	4	4	52	53	53
Three-and-a-half-order lights.....	19	23	38	13	41	7	6	13	32	23	32	10	7	7	7	7	157	17	90	7	10	10	10
Fourth-order lights.....	24	16	20	7	22	4	1	14	14	6	14	5	2	2	2	2	105	7	37	37	266	264	264
Fifth-order lights.....	1	5	31	3	11	6	1	2	18	16	12	12	12	12	12	12	161	7	55	111	148	149	149
Sixth-order lights.....	2	3	6	3	19	7	7	1	4	14	44	4	12	12	12	12	47	16	63	114	114	126	126
Lens lanterns.....	2	3	6	3	19	7	7	1	4	14	44	4	12	12	12	12	16	16	16	16	16	16	16
Range lenses.....	10	10	8	4	14	14	15	2	16	4	4	4	4	4	4	4	38	4	4	4	45	45	45
Reflectors.....	3	6	127	7	9	155	15	59	16	3	49	7	83	528	524	350	358	90	91	1,411	1,885	1,950	65
Tubular and other lanterns.....	10	10	7	4	3	8	3	2	4	4	3	1	1	1	1	1	29	1	11	49	7	11	41
Light-vessels in position.....	11	11	11	1	1	1	1	1	1	1	1	1	1	1	1	1	11	11	11	11	7	11	4
Electric buoys.....	4	4	3	2	1	1	1	2	1	1	1	1	1	1	1	1	12	12	12	9	9	12	3
Gas buoys.....	64	88	262	63	118	208	44	103	100	76	168	39	115	528	524	359	911	154	338	1,411	2,780	3,859	79
Total lighted aids.....	13	10	16	6	6	2	2	11	23	6	24	15	10	10	10	10	52	25	53	125	130	130	5
Fog signals operated by steam or hot air.....	17	10	50	7	63	3	3	11	7	3	4	7	3	3	3	3	180	10	15	1	186	185	—
Fog signals operated by clock work.....	103	73	40	5	10	50	38	13	13	1	1	49	42	2	2	2	330	91	1	2	412	424	12
Day beacons.....	11	12	5	4	1	6	3	4	1	1	1	12	8	1	1	1	46	20	9	66	66	66	—
Whistling buoys.....	18	15	22	6	1	15	5	2	2	2	2	6	4	4	4	4	84	10	2	2	92	98	4
Ball buoys.....	635	510	576	187	1,070	298	296	101	93	146	322	73	271	4	4	4	3,642	344	561	4,438	4,547	109	109
Other buoys.....	707	630	709	215	1,158	374	300	132	123	155	353	162	338	2	2	2	4,314	500	632	2	5,319	5,448	129
Total unlighted aids.....	861	718	971	278	1,276	582	344	235	223	231	521	201	453	530	524	359	5,225	654	1,015	1,413	8,099	8,307	208
Total number of aids.....	861	718	971	278	1,276	582	344	235	223	231	521	201	453	530	524	359	5,225	654	1,015	1,413	8,099	8,307	208

*Appropriations made at the third session of the Fifty-third Congress for light-house purposes.*

Supplies of light-houses .....	\$385,000
Repairs of light-houses .....	490,000
Salaries of light-keepers .....	690,000
Expenses of light-vessels .....	285,000
Expenses of buoyage .....	415,000
Expenses of fog signals .....	70,000
Inspecting lights .....	3,000
Lighting rivers .....	300,000
Survey of light-house sites .....	1,000

## SPECIAL WORKS.

Boston light-vessel, additional .....	35,000
Butler Flat, Massachusetts .....	45,000
Chequamegon Point light and fog-signal station, Wisconsin .....	10,000
Detroit River lights, Michigan, north and south ends of Grassy Island .....	6,700
Devils Island light and fog-signal station, Wisconsin .....	22,000
Eagle Harbor fog signal, Michigan .....	5,000
Grand Marais light-station, Michigan (making available) .....	4,000
Grand Marais Harbor of Refuge, light and bell, Michigan .....	15,000
Grays Harbor light and fog-signal station, Washington .....	39,500
Kennebec River lights, Maine .....	17,000
Lower Cedar Point light-station, Potomac River, Maryland (with power to contract up to \$75,000) .....	25,000
Manitowoc fog signal, Wisconsin .....	5,500
Maumee range light-station .....	20,000
Mendota light-station, Michigan .....	7,500
Mobile Ship Channel lights, Alabama .....	30,000
North Head light-station, Washington .....	25,000
North Manitou light and fog signal, Michigan .....	20,000
Oil houses for light-stations .....	5,000
Plum Beach light and fog-signal station, Rhode Island (with power to contract up to \$60,000) .....	20,000
Portage Lake Ship Canal Pierhead fog signal, Michigan .....	5,500
Porte des Morts range lights and fog-signal station, Michigan .....	21,000
Sheboygan fog signal, Wisconsin .....	5,500
Smith Point light-house, Chesapeake Bay, Maryland (with power to contract up to \$80,000) .....	25,000
South Fox Island fog signal, Michigan .....	5,500
Southwest Ledge fog signal, Connecticut .....	3,000
Spectacle Island range lights, Massachusetts .....	9,350
Spring Point Ledge light and fog signal, Maine (with power to contract up to \$45,000) .....	20,000
Squaw Point light, Michigan .....	5,000
Staten Island light-house depot sea wall .....	25,000
Sturgeon Bay Canal light-station, Wisconsin .....	20,000
Tibbetts Point fog signal, New York .....	4,300
Umatilla Reef light-vessel, Washington (with power to contract up to \$80,000) .....	40,000

## NEW WORKS AUTHORIZED.

Congress authorized, by act approved on February 15, 1893, the establishment of a number of light-stations at an aggregated cost of nearly half a million dollars, but made no appropriation at that time for their

construction. Since then, from time to time, appropriation has been made for the erection of many of them. The following is a list of the light-stations remaining for which no appropriation has yet been made, with the maximum amount which each may cost:

Galloo Island fog signal, New York.....	\$5, 700
Carlton Island light-house, New York.....	8, 600
Bay State Shoal lights, New York.....	800
Erie Harbor (Presqu'île) fog signal, Pennsylvania.....	4, 300
Fairport Harbor fog signal, Ohio.....	4, 300
Lorain Harbor (Black River) fog signal, Ohio.....	4, 300
Port Clinton light, Ohio, reestablishing.....	1, 500
Poe Reef light-vessel, Straits of Mackinac, Michigan.....	25, 000
Big Sable Point fog signal, Michigan.....	5, 500
Sand Hills light-house, Michigan.....	20, 000
Bayfield light and fog signal, Wisconsin.....	5, 000
Pats (or Hat) Point light and fog signal, Minnesota.....	15, 000
Ludington light and fog-signal station, Michigan, keeper's dwelling.....	4, 500
St. Joseph fog signal, Michigan.....	5, 000
St. Martin Island light, Michigan.....	15, 000
Little Gull Island light and fog signal, Michigan.....	20, 000
Peshtigo Shoal, Green Bay, Wisconsin.....	10, 000
Wilson Harbor light, New York.....	2, 500
Big Oyster Bed Shoal light and fog signal, New Jersey.....	25, 000
Deer Point light, Florida.....	1, 000
New York Slough light and fog signal, California.....	10, 000
Mermentau River light, Louisiana.....	7, 000
Willamette River, Oregon, 25 beacon lights and buoys between Salem and Portland.....	5, 000

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report, under specified headings, from which it will be evident that the Board has brought the numerous and varied aids to navigation under its charge up to the proper standard, and that it has done all that was possible, with the funds provided, to meet the requirements of commerce and navigation.

#### SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1895 was \$385,000. While the appropriation was the same as that of the previous year, the number of light-stations was increased, and it is reasonable to expect that appropriations will be made during the present session of Congress for still other light-stations.

The Board has found it impossible, with funds provided, to keep up its reserve stock of supplies with which to meet emergencies. This stock has been heavily drawn upon. The meagerness of preceding appropriations has made it necessary for the Board to cut down the quantity of supplies furnished yearly to the light-houses to such an extent that it can go no further without danger to the lights. In spite of the severe economy used, there is danger that the present lights and those which are being built can not be properly kept up without an

increase of appropriation. The passage of the eight-hour law has increased the price of the manufactured material used to supply light-houses. The Board therefore estimates that \$410,000 will be needed for providing supplies for light-houses during the coming fiscal year.

#### REPAIRS AND INCIDENTAL EXPENSES OF LIGHT-STATIONS.

The estimate submitted under this head is \$600,000. The appropriation for the current year is \$490,000. From this appropriation must be paid the cost of repairs and maintenance of all light-stations, numbering now some 1,014, many of which are very old, and therefore costly to maintain, as well as the cost of beacon lights to mark the ends of pierheads and at other localities on inland waterways and harbors. The law requires the Light-House Board to erect such beacon lights, but special estimates for this purpose can not be submitted in advance, since their erection usually depends upon the completion of piers and breakwaters, or the completion or progress of other works of improvement made by the Government to inland waterways. The cost of spare illuminating apparatus, which must be kept on hand to replace that which may be damaged or destroyed in service, is also paid from the appropriation for repairs and incidental expenses. Several estimates for special appropriations to make extensive renewals of buildings at light-stations have been omitted this year, since they can be done from the appropriation for general repairs if this is made sufficient. The amount asked is urgently needed for the efficient and economical maintenance of the service.

#### SALARIES OF LIGHT-HOUSE KEEPERS.

Last year Congress appropriated \$690,000 to pay the salaries of not exceeding 1,250 keepers. But 1,203 keepers were employed. In quite a number of instances the Board found itself unable to provide keepers for needed beacon lights which it had funds to build, and hence these lights were not established.

The statement made in the Board's last three annual reports in reference to this subject is repeated.

It has become necessary, in view of the great pressure on this appropriation, to temporarily omit filling certain vacancies as they occurred, where there was more than one keeper at a station. This has necessarily resulted in inferior service on the part of the overworked keepers remaining at those stations. Two men can not do the work of three properly for any extended term.

The duties of light-keepers have been greatly increased by the addition of steam fog-signal apparatus, requiring, in many cases, the attention of steam engineers. It has been found that it is impossible to obtain the services of men for many of these positions, for the pay offered, who hold certificates that they have passed examinations as steam engineers. Hence the Board has been unable to get the best results from its steam fog signals. The steam is not raised as soon as it might be so as to get the fog signal to sounding as soon as it should. The machinery gets out of order sooner than it would if in the charge of a skilled engineer. It remains out of use until a machinist is sent from a distant town at large expense in wages and

transportation to fix it, and the life of the machine is much shorter than it would be if in the charge of a certificated engineer. It is poor economy to stint the pay of engineers to such point that the services of only the poorest can be commanded, as it costs so much to remedy the mistakes they unavoidably make.

It has been found in practice that it is difficult to retain in the service men of sufficient experience and ability to operate and take the proper care of the delicate, complicated, and expensive illuminating apparatus placed in their charge. Hence it costs more than it formerly did, and more than it ought, to keep this apparatus in running order. The Board therefore suggests that it would be better, from an economical point of view, to raise the average salary of the light-keeper to the amount fixed by law rather than to maintain it at its present rate, and especially to decrease it still more.

The Board anxiously feels the difficulty with which it retains its trained and experienced light-keepers. The pay they receive is insufficient to induce them to remain in the service. During the four years between March 4, 1885, and March 4, 1889, 769 persons entered the service by original appointment. During the four years which elapsed between March 4, 1889, and March 4, 1893, 672 persons received original appointments into the Light-House Service. Each of these appointments was made to fill a vacancy made by cause. These causes were death, resignation, or removal. Each removal was made for specified written and recorded cause, and never for political reasons. The removals number, say, one in seven of all the vacancies. The vacancies caused by death are inconsiderable in number. The vacancies caused by resignation are, say, between five and six out of every seven.

Some of the light-stations are undermanned. At others, the more isolated, it is difficult to retain good men at the rates paid. The appropriations made do not permit the Board to pay the average rates allowed by law. But even on the present basis it is estimated that \$700,000 will be needed for salaries of light-keepers during the next fiscal year.

#### EXPENSES OF LIGHT-VESSELS.

Congress appropriated \$285,000 to defray the expenses of light-vessels during this fiscal year. The appropriation has been expended and many needed repairs go over to next year. The cost of the maintenance of the light-vessel which was established off Boston Bay, Massachusetts, in October, 1894, is to be defrayed by the appropriation for the coming year. The wear and tear on the older light-vessels was greater than usual, owing to their increased age. The Board estimates, therefore, that the expenses of light-vessels for the ensuing fiscal year will be \$350,000, and it is recommended that an appropriation of that amount be made therefor. Within the past two years the number of light-ships established has been increased by 33 per cent, but there has been no corresponding increase in appropriations necessary to meet the increased cost of maintenance.

#### EXPENSES OF BUOYAGE.

Congress at its last session appropriated \$415,000 for the expenses of buoyage during the current fiscal year. There are now some 4,725 buoys of all kinds in position. The buoys which were carried away or sunk at their moorings during the past year were replaced from the stock

held in reserve, and that reserve stock has not been replaced for lack of funds. The Board, therefore, will need a larger appropriation than usual, not only to meet the immediate wants of commerce, but to bring up its stock of reserve buoys to its normal condition. The Board was unable to place buoys at certain places for which request was made, not because it was unnecessary to do so, but because the appropriation therefor was insufficient. Funds are needed to maintain buoys after they are established. It is estimated that it will require \$500,000 to defray the expenses of buoyage during the coming year, and it is recommended that an appropriation of this amount be made therefor.

#### EXPENSES OF FOG SIGNALS.

The annual appropriation for this important part of the service has been \$70,000 for a number of years, notwithstanding that the number of fog signals has been constantly increasing by special appropriations made by Congress for new light and fog-signal stations, and by the establishment of fog signals at existing light-stations under the authority of law to meet the growing demands of commerce. The conditions are now such that it is impossible to maintain the service in a proper condition and to replace obsolete apparatus and make other urgently needed improvements at existing stations without increased appropriations for this purpose.

In the earlier development of sound signals for maritime purposes the United States led the world, and the majority of appliances now in general use for this purpose originated in this country and were first used by the Light-House Board. Important improvements have since been made, however, and many of them by officers in the Light-House Service of this country, which the Board has been unable to apply for lack of funds. Some of the improvements which are urgently needed and which could now be made are (1) more efficient quick-steaming boilers for stations using steam signals, to facilitate starting the signal when needed and to afford greater economy in operation; (2) compressed-air apparatus operated by oil engines for stations where the water supply is deficient; (3) improved striking apparatus to render fog bells more effective.

It is therefore again recommended that the appropriation for fog signals be made \$125,000.

#### LIGHTING OF RIVERS.

The appropriation of \$300,000 made at the last session of Congress was barely sufficient to maintain the post lights which had already been established. And it was insufficient to enable the Board to establish and maintain other lights which it is evident are much needed. It is estimated that \$350,000 will be required to defray the expenses of lighting rivers during the next fiscal year, and it is recommended that an appropriation of this amount be made therefor.



## NEW LIGHT-STATIONS AND DEPOTS.

The estimates for special appropriations for new light-stations and depots have been revised with particular care to bring them up to date and to make them conform to the actual needs of navigation in the various districts throughout the coast and inland waters. Several estimates formerly submitted for special appropriations to rebuild or renew existing structures have been omitted, as such work can be done more advantageously under the general appropriation for repairs, provided the latter be made sufficient, and the special estimates are thereby reduced to a minimum.

## NEW LIGHT-VESSELS.

The Board has recommended in the proper places in the body of this report that appropriations be made for building six new light-vessels. Each is much needed, but attention is especially invited to the urgent necessity for a relief light-vessel in the Fourth light-house district.

## NEW TENDERS.

Recommendation is repeated in certain of the following pages that appropriations be made for the construction of three steamers to be used as light-house tenders in the Second, Third, and Seventh light-house districts to replace old steamers now so nearly worn out that they can only last, if used with care, until new vessels can be built to take their places.

## OIL HOUSES.

The Board again recommends that appropriation be made for the erection of small, inexpensive structures near to, but separate from, light-houses, in which to keep a year's supply of mineral oil, the illuminant now used by the Light-House Establishment. Last year the Board estimated that \$15,000 could be expended with great advantage during the year among the larger, more isolated, and more important light-stations. An appropriation of \$5,000 was made for that purpose, which will be expended during the current year.

It is estimated that \$10,000 will be needed and can be profitably expended in building oil houses during the coming fiscal year, and the appropriation of that amount is therefore recommended.

The recommendation made in the annual report for each of the last nine years was accompanied by the following explanation:

The substitution of mineral oil for lard oil in the light-house service, which has been in progress several years, is now finished. As the quantity of the oil now used is larger, and as its bulk is greater than was that of the oil formerly used, and as the mineral oil is much more likely to occasion fire, and indeed to take fire, than was the lard oil, the Board has come to the conclusion, in the interest of safety, to advise that the proper steps be taken to have a house erected at each of the larger stations, from a plan specially devised after a careful study, for the purpose.

## TELEPHONIC COMMUNICATION BETWEEN LIGHT-SHIPS AND SHORE.

The progress made in the Board's experiments looking to the use of sea telephones as a means of communication between its light-vessels and the shore is fully set out in the following report to the Board by its late superintending electric engineer, Prof. Lucien I. Blake, who obtained leave of absence from the State University of Kansas to do this work for the Light-House Establishment:

PHYSICAL LABORATORY, UNIVERSITY OF KANSAS,  
*September, 1895.*

SIRS: I have the honor to submit herewith my report upon the experiments in telephonic communication between Sandy Hook and the Scotland light-ship. These were carried on under the authority of the Board, and the purpose was to test practically a method proposed by the writer. Experiments were begun in August, 1894, and continued until July 1, 1895. During this period the work was frequently interrupted and prolonged by delays in constructing apparatus and in obtaining material. Nearly three months were unnecessarily consumed by the manufacturers in making the special cable for the grid; the difficulty of getting to and from the Hook and the light-ship in the winter season retarded progress, and the cold weather and rough water around the light-ship made experimenting from small boats difficult and slow. Work, however, was carried on as continuously as possible in the laboratory of the Light-House Establishment at Tompkinsville, on Staten Island Bay, on Sandy Hook, and around the light-ship. Nearly every point, in carrying out the methods described, had to be independently experimented upon. Nearly all apparatus had to be specially devised and constructed. It was anticipated that the electrical energy obtainable on shipboard would necessarily be an extremely small fraction of that delivered by the transmitter, and consequently every detail became important.

Account is here given of a second method also, upon which experiments in the preceding year had been made. Each method has its advantages and its warranty of success.

The difficulty of communicating electrically with light-vessels by direct metallic connection lies wholly in bringing the end of a submarine cable on board and maintaining it there under the various changes of the ship's position and against its motions. The fouling of the cable with the anchor chain has proven so far the chief insurmountable difficulty. Various devices to maintain cable connection with the ship have been made by the light-house authorities of several nations, and interesting accounts are recorded, particularly in the several reports of the British Royal Commission on Electrical Communication with Light-Houses. It may be stated that no method has yet been reported as successful.

In 1889 it occurred to my assistant and myself to make use of the ship's anchor chain as a part of the cable circuit, and experiments to this end were inaugurated in the summer of 1893 at the Buoy Depot at Woods Hole, Mass. Relief light-vessel No. 39 was anchored about a mile offshore in Vineyard Sound, and a temporary cable of No. 14 copper wire, okonite insulation, laid out to it. The core of this cable was connected with the stem of the mushroom anchor. The ship rode with 30 fathoms of 2-inch wrought-iron chain. Although the chain was new and was painted with asphaltum, still the friction between the links kept their contact surfaces bright, and sufficient electrical connection was established and maintained to deliver to suitable receiving telephones upon the ship a current ample for excellent talking. The so-called "solid-back" transmitter of the Bell Telephone Company was employed. The method was inspected by Capt. Frederick A. Mahan, U. S. A., engineer secretary of the Board; Commander George F. F. Wilde, U. S. N., then inspector second district; Mr. Arnold B. Johnson, chief clerk of the Board, and by others. The sea-

weed moving on the bottom in the rapid tidal currents of Vineyard Sound repeatedly broke the slender cable employed, necessitating frequent underrunning and relaying, and no attempt was made to continue the communication after the inspection.

The following winter the Popes Island Manufacturing Corporation, of New Bedford, Mass., made for the writer a 5-fathom chain of one-half inch Howard metal, which is noncorrodible in sea water and whose electrical conductivity is about that of brass. This experimental chain, when submerged, conducted, so far as practical results are concerned, apparently as well as a continuous insulated cable. Unfortunately, to the present time no successful method is known of welding this metal into links sufficiently heavy for anchor purposes. Its tensile strength, as shown from tests at Watertown arsenal, is reported to be about 90,000 pounds to the square inch, and this property, coupled with its noncorrodibility, would make it of special value for light-vessel anchor chains, independently of its service in electrical communication. From the experiments of 1893 there is encouragement to believe that through the ship's anchor chain, and quite surely so if it be of noncorrosive metal, such as the Howard, telephone connection can be established by the above method, and such method would be the simplest possible for light-ships.

In the following summer (1894) experiments were made upon another method of telephoning to light-ships, and in the course of these, incidentally, an observation was made upon the above-described chain method. A submarine cable 5 miles long, which was in use for experiment, became fouled with the Scotland light-ship anchor chains. Its copper core came into metallic contact with the chain about 60 fathoms from the ship. A receiving telephone, which was connected with the hawse pipe of the ship and thereby directly with the anchor chain, became so loud as to be heard everywhere in the ship's cabin and indicated direct metallic connection through to the shore. To determine if this was the case, an insulated wire was then connected directly with the core of the cable and brought on board, and matters so arranged that the telephone could be alternately cut into the cable circuit either through the insulated wire or through the hawse pipe connection and anchor chain. No decisive difference in the loudness of the telephone could be detected. It seemed right to conclude, therefore, that the current passed through a portion of the anchor chain. Other experiments under way have precluded, to this time, further tests upon this chain method. Sufficient has been done, however, to encourage the belief that the anchor chain may be successfully used to complete electrically the cable circuit.

The second method, which has been alluded to as being experimented upon in 1894, will be designated the diffusion method. It, like the chain method, was devised by us to avoid bringing the end of a submarine cable from the sea bottom up on board ship. The anchor chain was not made part of the telephone circuit in this method, but the entire region of water in which the ship could swing was electrified in such a way by the telephone current as to present differences of potential at different points in its area sufficient for telephonic purposes. By order of your Board the experimental plant which was to test the method was located off Sandy Hook, N. J., a place convenient to the shops of the Department at Tompkinsville, and in ordinary weather easily accessible to the light-house tenders. The Scotland light-vessel was selected with which to establish communication. This was  $4\frac{1}{2}$  miles offshore, in  $10\frac{1}{2}$  fathoms mean low water. It was not the intention to establish permanent communication with this vessel, as communication at this point would not be of particular service to the Department.

The method in general was carried out in the following manner: An iron-armored submarine cable was laid from Sandy Hook, at the power station of the Gedney Channel Electric Buoy System, out to the Scotland light-ship, 5 statute miles, of which one-half mile was underground across the Hook. This cable terminated in a junction box on the sea bottom, about 900 feet from the mushroom mooring anchor of the light-ship. The location of the light-ship and the course of the cable are shown in the accompanying map, Pl. I. The cable was a portion of that used at the World's

**Third District.****BUOYAGE.**

The weather during the winter was very cold, and heavy moving ice, from February onward, was continuous in all the navigable channels of the district. In New York Bay and Harbor the movement was so constant that the electric-lighted buoys of the Gedney Channel, including the buoy at Southwest Spit, were all extinguished from February 6 to March 9, a period of 32 days, with the exception of a few days at the end of February, when there was an intermittent display by one or more of the electric lamps. At other times, owing to collisions of vessels or defects in the cables, the different lamps were extinguished for short periods, but they were never all out at once. The average extinguishment of each lamp during the year was 51 nights. The Southwest Spit buoy was not relighted until March 25.

The history of the electric-buoy station in the past year is briefly as follows:

*Cables.*—The triple-conductor cables were broken twice, once in August and again in September, and the single-conductor cables five times. The repair of the latter required the expenditure of 600 feet of new cable. The heaviest work of renovation was done by the light-house tenders, while all the minor repairs, including those of pumps, engines, and dynamos, were done by the keepers of the station. On March 5, 1894, the cable of the Southwest Spit electric buoy was fouled and broken by an unknown vessel.

*Plant.*—The new plant furnished consists of two alternating-current dynamos, a switch board, two station transformers, and a Fitzgibbon boiler, which replace the two old upright boilers. The armor of the single-conductor cable is eaten away in parts by corrosion, and is badly worn by long use. The dynamos and engines were run on alternate nights for about ten months, and one set of buoys served throughout the year, with the exception of the buoy at Southwest Spit, which was destroyed by collision. The consumption of coal was 340 tons, or 12 tons less than that of the preceding year.

The dwellings of the keepers were repaired, and the station is now in good order. The shore end of the telephone cable to the Scotland light-ship terminates at this station, and the instruments are in charge of the light-keeper.

On May 2, 1895, the work of installing the cables, buoys, transformers, and other appliances of the new or alternating-current system was begun, and May 14 it was completed and put into experimental operation for 30 days, according to the terms of the contract with the General Electric Company of New York, by whom the new plant was furnished.

The new system embraces eleven buoys, or four more than the old one. The experimental operation was successful. Oil lanterns marked

However, with this small amount of energy available at the transformer (less than one seven-hundredth of a horsepower) there was found with the light-house tender *Gardenia*, which was suitably equipped with transmitting and receiving circuits, over 16 acres of water around the light-ship throughout which telephonic conversation could be carried on with Sandy Hook station and while under full steam. As the *Gardenia* has a wooden hull without sheathing, two plates of sheathing metal 7 by 3 feet were attached to bow and stern and wires run from them to the pilot house, as shown in the cut annexed, Pls. IV and V. The plates were about 113 feet apart, and sufficient potential difference existed over the 16 acres to operate well. Indeed, we were able from the *Gardenia* to talk with the light-ship or with the Sandy Hook station or to hear the conversation between the Hook and the light-ship while we were steaming about. The circuit upon the light-ship was made as follows: The two hawse pipes were connected together in the hold by a copper bar  $2\frac{1}{2}$  by  $\frac{1}{4}$  inches cross section, and extra plates put between the metallic sheathing of the ship and the hawse pipes outside to assure good connection through to the water. The circuit was then continued from the copper bar to the after cabin through a stranded insulated cable equivalent to No. 3/0 wire. Here it was connected with a telephone cupboard, which was bolted to the bulkhead in the cabin, and convenient supports against the rolling of the ship provided for the person using it. A similar cupboard was used at the shore end.

When the telephone was not in use the calling device was alone in circuit. The opening of the cupboard door cut out this device automatically and cut in the receiver. The receivers were of the watch form, made by the National Telephone Company of Boston, but were rewound by us to the best resistance, which was determined by an extended series of experiments both for the ship and the shore instruments. The ship's receivers were arranged in the form as shown in Pl. VII, which left the hands free for support against the ship's motions. A favorite shore form is also shown, Pl. VII, which combined transmitter and one receiver on one support. The transmitters were cut in only in sending. Both transmitters and receivers were used with induction coils. Much experimenting, both in the laboratory and on each end of the line, was done to determine not only the advantages of induction coils, but also the proper design and construction of the coils. A detailed account of the methods and apparatus used would be too extended for this report. Suffice it to say, open-circuit coils were selected; step up at the shore end, 900 turns No. 16 wire in the secondary; on the ship, step down, 40 turns No. 7 on the secondary.

From the cupboard in the cabin the stranded cable was continued to the after deck, thence along the underside of the main boom through a block at its end, and there dropped down to a submerged ground. This ground was devised to meet both the electrical and nautical requirements. Four 30-foot lengths of 3-inch manila rope were taken, and a strip 2 inches wide of sheathing metal wound spirally around each, with a quarter inch space between each turn. At each foot the metal was riveted through the rope. The four ropes were then connected in parallel at one end. Each rope became then a flexible conductor trailing from the boom end. The pulley block allowed them to be raised or lowered, as need be, and the slack was neatly coiled off of the way in cleats on the side of the after hatch. This tail piece has been in use now ten months, in all sorts of weather, never fouling, handled by the sailors, and coiled on the deck like any ordinary rope when not in use. This tail piece would generally tend the tide quite freely. The extreme distance between bow sheathing and the tail rope was about 120 feet. Experiment, however, showed that sufficient difference of electrical potential existed also between the bow and rudder sheathing, and even between the bow and stern sheathing, to operate the receiver, although of course not as well as between bow and tail ropes.

The laying of the grid in the winter season was a difficult task, but was successfully accomplished by the skill and excellent judgment of Capt. C. A. Ruland, of the steamer *Gardenia*, and now of the *John Rodgers*. Experimenting was begun in August,

1894, and by delays for materials, etc., and interruptions from the inclement weather, prolonged into the winter of 1895. The final connection between grid and cable was made February 23, 1895, and at 7 o'clock on that Saturday evening telephonic messages were sent, the first, so far as known to the writer, ever transmitted between ship and shore without metallic connection. To the present writing (September, 1895) the system has been in operation in different conditions of weather. The officers of the light-ship and the electric light-station men on the Hook have been the chief users. The system has been visited and used by the naval secretary of the Board, Commander George F. F. Wilde, U. S. N., Mr. Arnold B. Johnson, chief clerk of the Board, and by very many others. Pending the completion of the calling devices, the telephone was made practically useful daily by some one both on ship and shore reporting at the instrument for five minutes at each hour from 9 a. m. to 5 p. m. each day. The particular advantages and uses made of the telephone up to this time are outside the scope of this report. It might be incidentally mentioned that during the recent international yacht races reporters of both the United and Associated Press were placed upon the Scotland light-ship, and themselves telephoned the progress of the races to the New York papers.

After the completion of the talking portion of the system the writer was ordered to return to his regular professional duties at the University of Kansas. Thereafter the experiments upon the calling-up devices were conducted under the direct charge of my assistant, Eugene W. Caldwell. It is proper for me here to state that the success of this complete experimental system is largely due to the signal ability and ingenuity of Mr. Caldwell, graduate electrical engineering department, University of Kansas. I include at this place his special report on

#### CALLING DEVICES.

"These experiments to develop a proper calling system for the telephone circuit between Scotland light-ship and Sandy Hook were begun about March 23 and continued until August 1, 1895. The work progressed necessarily slowly and was often delayed by bad weather and by the difficulty of getting to and from Sandy Hook and the light-ship.

"It was not attempted to install a permanent equipment after the desired result had been accomplished with experimental apparatus.

"At the beginning of these experiments the problem presented very serious difficulties. It was known that the energy of the telephonic current received at the ship was very much less than was delivered into the line at the shore, and the efficiency of operation from ship to shore was known to be equally low. Measurements have been referred to that show that the strongest transmitter currents represent only 1.5 to 2 watts.

"Many experimenters have shown that the magneto-telephone receiver will 'talk' well with currents which represent 0.001 watt or less. On this basis it was reasoned that the efficiency of the Scotland system is five hundredths of 1 per cent or less. This value for maximum efficiency was assumed in the first experiments for calling.

"Very recent measurements by the writer show that the maximum efficiency of the Scotland system does not exceed 0.00004 of 1 per cent. These measurements were made possible by the use of a very sensitive electro-dynamometer, which was kindly loaned the writer by Mr. Hamilton, chief electrician of the Western Electric Company, New York. Repeated tests were made which make it certain that this result for maximum efficiency is approximately correct. This means that the 0.000004 part of the energy of our telephone transmitter is sufficient to operate a receiver, and that we can not expect to recover at one end of our line much more than that fraction of the total energy applied at the other end.

"With a system of such a low efficiency it is, of course, impossible to operate directly a bell or alarm of any kind with the received 'calling current' produced by a moderate amount of power. It was obvious from the start, therefore, that the bell or alarm must be operated by a local battery, the circuit of the local battery and bell being closed by a very sensitive relay actuated by the received calling current.

"It was certain also that with the most efficient relay we could hope to obtain it would be necessary to employ a calling current of considerable power.

"The fact that a submerged transformer was included between the main cable of the system and the grid made it necessary to use alternate currents, and the safe capacity of this transformer being only about 75 to 100 watts at 125 cycles per second limited the 'shore to ship' calling current to that amount, unless a larger transformer was substituted. For many reasons such a change was not then advisable. The fact that the main cable had only one conductor made it necessary to use the same submerged transformer for both talking and calling.

"It is well known that transformers are generally most efficient at full load and very inefficient when the load is small. Hence a large transformer adapted for strong calling currents would probably be very inefficient for the weaker talking currents, and might seriously impair the talking efficiency of the system.

"These difficulties were anticipated to some extent in the first transformer, which was especially designed to work efficiently at small loads and was made as large as then seemed consistent with good results in the telephone.

"Now, when it is considered that the safe 'shore to ship' calling current was limited by the submerged transformer to about 100 watts; that sufficient funds were not available to equip the ship for 'ship to shore' work, and thus avoid the transformer difficulties; that the efficiency of the system was as low as 0.00004 per cent; that the relay which was to close the bell circuit must be operated by an almost infinitesimal current, and finally that this delicate relay must not be affected by the violent motion of the light-ship, it will be seen that there was a rare combination of serious obstacles to be overcome in perfecting the calling system.

"Two general methods for solving this problem suggested themselves. In the first method, which for convenience may be called the synchronous method, a sending device would be provided capable of producing in the line alternating currents of a constant frequency such as would be produced by an induction coil whose primary circuit is opened and closed by the vibrations of a tuning fork. The receiving apparatus or relay for this system would be vibratory in character and tuned to a frequency of vibration to correspond with the period of the calling current. In addition to this mechanical adjustment, the electrical circuits might be adapted by the use of condensers and inductances to respond more readily to alternate currents of the same period.

"The action of such a system would be cumulative, i. e., each successive impulse of current would arrive just in time to increase the vibration in the relay until sufficient amplitude would be obtained to operate a circuit-closing device.

"There is no doubt that this principle furnishes the best possible method of producing a mechanical action with a very weak alternating current and that a simple and reliable relay of this kind could be made. The greatest objection to this system is on account of the great difficulty of producing powerful alternating currents of a perfectly constant period. Tuning forks with 'make and break' attachments are unsatisfactory for many reasons, but chiefly on account of the burning of contacts when strong currents are used. To drive a dynamo at a speed sufficiently constant for this system would be impracticable. A Tesla 'oscillator' might prove satisfactory.

"It was thought best therefore to begin work with what we called the nonsynchronous method. This method consists briefly in using a powerful 'sending' current of any convenient frequency and a relay whose operation is independent of the frequency of the calling current. This method permitted the use of any of the old and tried methods of producing alternating currents for calling, and the only serious difficulty was to make a successful relay.

"With a view to carrying out this method experiments were begun at once to perfect a suitable relay, and at the same time arrangements were made to get apparatus for producing the calling current. The instruments were necessarily crude, and adapted only for the experimental part of the work because funds were not available at the time.

### Third District.

the loss of iron buoys in the past year was not very heavy. This includes four whistling buoys and two bell buoys. The iron buoys were replaced by March 31.

In compliance with a request from the Navy Department a speed trial course was laid off September 14, 1894, for the U. S. torpedo boat *Ericsson*. Ten iron buoys, painted white, were placed as required, and they were removed after the completion of the trial.

Several wrecks were marked with buoys, which were taken up when no longer required. Five ordinary buoys were placed on new stations, and two were discontinued.

### DEPOTS.

*Tompkinsville, Staten Island, New York.*—This is the general depot of the Light-House Establishment. A portion of the annual supplies for the entire service and some of the incidental supplies are purchased, by contract whenever practicable, stored at this center, and distributed by the supply steamer and the freight lines running from New York and vicinity.

The operations performed here are on a large scale, and are well and systematically carried out by a small force of men. The arrangements and appliances are so well adapted to the work that all requirements are met with promptitude and skill. The operations carried on are so quiet and smooth that a visitor would hardly realize the value and extent of the business done here.

The shops for lampists, blacksmiths, carpenters, and boat builders are in full operation; and painting, sailmaking, and repairs of tenders are done by the men employed at general work. The fire department of the depot is made up of the mechanics and laborers of the yard, and the crews of vessels lying at the wharves. It is complete and efficient, so that engines and men are in place, and the lines of hose playing within a few minutes from the ringing of the bell, day or night.

The depot is lighted by electricity from the power house in the yard, and the shops and stores are heated by steam. Economy of expense and safety to the premises are thus secured, while the light furnished is of a better quality than that supplied by outside works. The plant and steam machinery are in good order and well kept.

The storehouse was built in 1863, when space was required for only 2,600 packages. The growth of the service may be inferred from a comparison of figures. In 1894, 9,050 packages were stored, and last year 11,312, without reckoning paints, paint oil, and chimneys, now kept elsewhere. The estimates of last year did not provide for the extension of the storehouse, which would have added to them some \$20,000 more.

The boiler of the power house received a new magnesia covering.



wire, *b*, carrying an alternating current. This one failed to be sensitive enough, probably for the same reason as the other.

"Still another similar trial relay is shown in Pls. XII and XV. Two flat coils of insulated wire are shown at *a* and *b*. The coil *a* is fixed and *b* is arranged with fiber suspension to move about a vertical axis, as shown. Connection is made with the ends of the wire of the movable coil *b* by means of two mercury cups, *CC*. A counterpoise weight is shown at *d*. Contacts for the local bell circuits are shown at *e*.

"In this relay it was hoped to improve upon the two just described by omitting the iron from the magnetic circuit and by using greater amount of copper. The instrument was used in two different ways, as follows: (1) The received calling current was made to traverse both coils, thus causing either an attraction or repulsion between them according to whether they were connected so that at any instant the current in the two coils was in the same or in opposite direction. (2) The ends of the movable coil *b* were connected together and the received calling current was sent through the fixed coil *a* alone. With this arrangement the fixed coil *b* acts like a block of metal. An alternating current in the fixed coil *a* always produces a repulsion of *b*, which is due to the reaction of the induced current in *b* upon the inducing current in *a*. A constant or unvarying current produces no effect with this arrangement.

"With either of these two methods of connection this relay proved to be much better than the ones having soft iron cores, but it was still far from being efficient enough, and its extreme susceptibility to change of level prohibited its use except possibly for the shore station.

"The mechanical difficulties of these instruments might have been overcome by improvement in the details of construction, and the efficiency would probably have been increased somewhat by using still more copper in the coils; but after having given them many careful trials and measuring the power necessary to operate them, it seemed best, to the writer, to discard the principles involved and try something else.

"It should be noted that a distinction is made here between the sensitiveness and the efficiency of an instrument. A sensitive instrument may produce a certain mechanical effect with an exceedingly small current strength in amperes, but if its resistance is high considerable energy is represented by even a very small current flowing in its coils. An efficient machine is one in which, for a given mechanical effect, the electrical energy absorbed is small. Since a given alternating current is readily converted by a transformer into one of either large or small strength in amperes, but always representing the same amount of energy, it is evident that in our relays we require a machine of great efficiency, but not necessarily of great sensitiveness.

"A careful study of all kinds of instruments in which weak alternating currents produce mechanical movement shows that by far the most efficient ones are those in which the current does not produce an alternating magnetic field as in the electro-dynamometer, but operates to increase and decrease the strength of field of a permanent magnet. The mechanical motion produced by such polarized machine is always vibratory.

"With currents of very small amount of energy the amplitude of the resulting mechanical vibration is necessarily very small, as is the case with the magneto-telephone. Practically it is found to be far too small to operate directly a circuit-closing device for an electric bell. Hence it is necessary in employing the principle in our relay to obtain from an exceedingly small vibratory movement a greatly magnified mechanical action which will serve to open or close an electrical circuit. The writer has designed and made drawings for a machine which accomplishes this result. This machine, which we called a 'ratchet relay,' is shown in Pls. XVI and XVII. The vibratory parts consist of two large magneto-telephones of special design. Attached to the center of each diaphragm by a light spring of flat steel is a light pawl.

The points of these pawls are of hardened steel, wedge shaped and carefully sharpened. These sharpened ends rest lightly on the periphery of a light wheel, which is made of soft brass. The narrow face of this wheel is slightly rounded and highly polished. The wheel carries on its shaft platinum contacts (not shown in these photographs), which close the local electric-bell circuit four times in each revolution. Now, when an alternating current traverses the coils the pawls are set into vibration, and engaging the wheel on the 'out' motion only cause it to revolve slowly in the direction shown by the arrow. A quarter revolution of the wheel is sufficient to close the local current and ring a bell.

"It is obvious that the bell may be large or small, or that any number of bells may be used and located anywhere they may be needed, it being necessary only that they be connected by wire with the relay.

"Much time was spent in testing this machine and perfecting its details. Only a general description is here given. It was found, during a test of five days aboard the light-ship, that although the weather was rough the motion of the ship did not affect the relay in such a way as to ring the bell. The bell was rung from Sandy Hook repeatedly and positively. The calling current, however, was much in excess of the safe carrying capacity of the submerged transformer.

"Careful measurements in the laboratory show that this relay will work positively with a current representing 0.0001 watt, and that it can be operated with much less energy than this.

"The last experiments on the Scotland line were made about July 20. As the work had to be stopped August 1, it was, of course, impossible in the few days left to accomplish anything in the way of permanent equipment for calling. During these few days laboratory experiments and calculations were made which resulted in much useful data regarding the efficiency of the relay and the power necessary to operate it successfully over the 'Scotland' telephone line. The results of the experiments and the actual performances of the system from shore to light-ship warrant the conclusion that if properly equipped the ratchet relay system would furnish a practical solution of the calling problem."

After the success of the ratchet relay was demonstrated, as set forth in the above report, further experimenting was discontinued and the system left in daily operation to the present time.

It is evident that in the present Scotland system the submerged transformer is of too small capacity for the most suitable calling device. It is further evident that any increase in efficiency in the telephone system as a whole would greatly lessen the difficulties of calling and increase the positiveness of talking. Could transmitters converting a greater amount of energy be devised the talking efficiency would be also correspondingly increased.

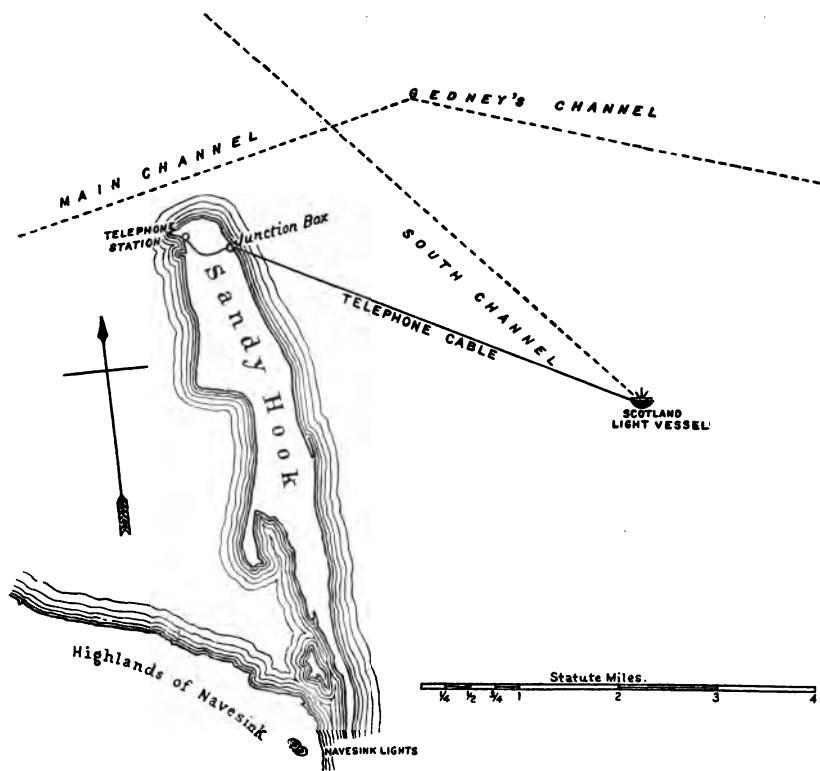
It is to be understood that the special form of grid and all the details of electrical construction, given above, were designed for the particular conditions existing at the Scotland light-vessel. These conditions took into consideration tidal flows, shape and area of ship's swing around her moorings, length and character of cable, etc. Each light-ship would present probably a special problem in electrical engineering, but I think the conclusion is warranted that the six months' (to the present time) successful use of this experimental plant at the Scotland light-vessel proves that the diffusion method is practically feasible.

In conclusion, I beg to express my appreciation of the kindly support continually given by the naval secretaries of the Board, Capt. Robley D. Evans, U. S. N., and Commander George F. F. Wilde, U. S. N., and Mr. Arnold Burges Johnson, chief clerk of the Board; also of the invaluable and ever ready aid by Capt. W. S. Schley, U. S. N., and Commander A. S. Snow, U. S. N., inspectors Third district, and by Lieut. Commander Clifford H. West, U. S. N., assistant to the inspector.

Respectfully,

LUCIEN I. BLAKE.

The LIGHT-HOUSE BOARD,  
*Washington, D. C.*



## TELEPHONIC COMMUNICATION BETWEEN LIGHT-SHIPS AND SHORE.

The progress made in the Board's experiments looking to the use of sea telephones as a means of communication between its light-vessels and the shore is fully set out in the following report to the Board by its late superintending electric engineer, Prof. Lucien I. Blake, who obtained leave of absence from the State University of Kansas to do this work for the Light-House Establishment:

PHYSICAL LABORATORY, UNIVERSITY OF KANSAS,  
*September, 1895.*

SIRS: I have the honor to submit herewith my report upon the experiments in telephonic communication between Sandy Hook and the Scotland light-ship. These were carried on under the authority of the Board, and the purpose was to test practically a method proposed by the writer. Experiments were begun in August, 1894, and continued until July 1, 1895. During this period the work was frequently interrupted and prolonged by delays in constructing apparatus and in obtaining material. Nearly three months were unnecessarily consumed by the manufacturers in making the special cable for the grid; the difficulty of getting to and from the Hook and the light-ship in the winter season retarded progress, and the cold weather and rough water around the light-ship made experimenting from small boats difficult and slow. Work, however, was carried on as continuously as possible in the laboratory of the Light-House Establishment at Tompkinsville, on Staten Island Bay, on Sandy Hook, and around the light-ship. Nearly every point, in carrying out the methods described, had to be independently experimented upon. Nearly all apparatus had to be specially devised and constructed. It was anticipated that the electrical energy obtainable on shipboard would necessarily be an extremely small fraction of that delivered by the transmitter, and consequently every detail became important.

Account is here given of a second method also, upon which experiments in the preceding year had been made. Each method has its advantages and its warranty of success.

The difficulty of communicating electrically with light-vessels by direct metallic connection lies wholly in bringing the end of a submarine cable on board and maintaining it there under the various changes of the ship's position and against its motions. The fouling of the cable with the anchor chain has proven so far the chief insurmountable difficulty. Various devices to maintain cable connection with the ship have been made by the light-house authorities of several nations, and interesting accounts are recorded, particularly in the several reports of the British Royal Commission on Electrical Communication with Light-Houses. It may be stated that no method has yet been reported as successful.

In 1889 it occurred to my assistant and myself to make use of the ship's anchor chain as a part of the cable circuit, and experiments to this end were inaugurated in the summer of 1893 at the Buoy Depot at Woods Hole, Mass. Relief light-vessel No. 39 was anchored about a mile offshore in Vineyard Sound, and a temporary cable of No. 14 copper wire, okonite insulation, laid out to it. The core of this cable was connected with the stem of the mushroom anchor. The ship rode with 30 fathoms of 2-inch wrought-iron chain. Although the chain was new and was painted with asphaltum, still the friction between the links kept their contact surfaces bright, and sufficient electrical connection was established and maintained to deliver to suitable receiving telephones upon the ship a current ample for excellent talking. The so-called "solid-back" transmitter of the Bell Telephone Company was employed. The method was inspected by Capt. Frederick A. Mahan, U. S. A., engineer secretary of the Board; Commander George F. F. Wilde, U. S. N., then inspector second district; Mr. Arnold B. Johnson, chief clerk of the Board, and by others. The sea-

weed moving on the bottom in the rapid tidal currents of Vineyard Sound repeatedly broke the slender cable employed, necessitating frequent underrunning and relaying, and no attempt was made to continue the communication after the inspection.

The following winter the Popes Island Manufacturing Corporation, of New Bedford, Mass., made for the writer a 5-fathom chain of one-half inch Howard metal, which is noncorrodible in sea water and whose electrical conductivity is about that of brass. This experimental chain, when submerged, conducted, so far as practical results are concerned, apparently as well as a continuous insulated cable. Unfortunately, to the present time no successful method is known of welding this metal into links sufficiently heavy for anchor purposes. Its tensile strength, as shown from tests at Watertown arsenal, is reported to be about 90,000 pounds to the square inch, and this property, coupled with its noncorrodibility, would make it of special value for light-vessel anchor chains, independently of its service in electrical communication. From the experiments of 1893 there is encouragement to believe that through the ship's anchor chain, and quite surely so if it be of noncorrosive metal, such as the Howard, telephone connection can be established by the above method, and such method would be the simplest possible for light-ships.

In the following summer (1894) experiments were made upon another method of telephoning to light-ships, and in the course of these, incidentally, an observation was made upon the above-described chain method. A submarine cable 5 miles long, which was in use for experiment, became fouled with the Scotland light-ship anchor chains. Its copper core came into metallic contact with the chain about 60 fathoms from the ship. A receiving telephone, which was connected with the hawse pipe of the ship and thereby directly with the anchor chain, became so loud as to be heard everywhere in the ship's cabin and indicated direct metallic connection through to the shore. To determine if this was the case, an insulated wire was then connected directly with the core of the cable and brought on board, and matters so arranged that the telephone could be alternately cut into the cable circuit either through the insulated wire or through the hawse pipe connection and anchor chain. No decisive difference in the loudness of the telephone could be detected. It seemed right to conclude, therefore, that the current passed through a portion of the anchor chain. Other experiments under way have precluded, to this time, further tests upon this chain method. Sufficient has been done, however, to encourage the belief that the anchor chain may be successfully used to complete electrically the cable circuit.

The second method, which has been alluded to as being experimented upon in 1894, will be designated the diffusion method. It, like the chain method, was devised by us to avoid bringing the end of a submarine cable from the sea bottom up on board ship. The anchor chain was not made part of the telephone circuit in this method, but the entire region of water in which the ship could swing was electrified in such a way by the telephone current as to present differences of potential at different points in its area sufficient for telephonic purposes. By order of your Board the experimental plant which was to test the method was located off Sandy Hook, N. J., a place convenient to the shops of the Department at Tompkinsville, and in ordinary weather easily accessible to the light-house tenders. The Scotland light-vessel was selected with which to establish communication. This was  $4\frac{1}{2}$  miles offshore, in 10½ fathoms mean low water. It was not the intention to establish permanent communication with this vessel, as communication at this point would not be of particular service to the Department.

The method in general was carried out in the following manner: An iron-armored submarine cable was laid from Sandy Hook, at the power station of the Gedney Channel Electric Buoy System, out to the Scotland light-ship, 5 statute miles, of which one-half mile was underground across the Hook. This cable terminated in a junction box on the sea bottom, about 900 feet from the mushroom mooring anchor of the light-ship. The location of the light-ship and the course of the cable are shown in the accompanying map, Pl. I. The cable was a portion of that used at the World's

Columbian Exhibition in Chicago to light the electric buoys along the lake front. It is described in detail in "Report on electric buoys," by Lieut. Commander C. H. West, U. S. N., Report of the Light-House Board, 1893. The cable was made by the Bishop Gutta-Percha Company, New York, and consisted of a single core of seven No. 16 B. & S. copper wires, three-sixteenths inch thick pure gutta-percha insulation, one-fourth inch thick layer of tarred jute, and an armor of sixteen No. 5 iron wires.

Through the courtesy of the Western Union Telegraph Company, the twin-screw cable steamer *Western Union* laid the cable on September 30, 1894. The illustration, Pl. II, shows the manner of taking the cable on steam reel aboard the *Western Union* preparatory to laying it; all other cable laying and handling was done by the tender *Gardenia*, under the skillful direction of Capt. C. A. Ruland. The half mile under-ground portion was connected with the submarine portion through a junction box buried in the sand at the shore end. This enabled the cable to be tested in either direction whenever necessary. From the submerged junction box a short length of cable was laid to another larger junction box containing a step-down transformer, so constructed as to be unaffected by submersion. The core of the cable was grounded upon the armor of the cable through the higher resistance coil of this transformer. This latter was proportioned electrically for the particular circuits connected to it, and operated with closed magnetic circuit. Details of design and construction are not here given in this general report. The two terminals of the lower resistance coil were grounded through a grid laid upon the sea bottom. This grid consisted of three insulated copper wires, each of 27 No. 10 wires (equivalent to No. 3/0 B. & S.), each 1,200 feet long and laid parallel about 300 feet apart. At one end the three were connected together and to one terminal of the lower resistance coil of the transformer. Each of the other three ends were grounded on a netting of 500 square feet of 3-inch mesh No. 12 copper wire. The other terminal of the transformer was grounded on 1,500 square feet of similar copper netting. These grounds were rolled up and handled with ease by the sailors while laying them from small boats. The center of the grid was approximately the ship's moorings. It is evident that the grid constructed thus was of exceedingly low resistance.

A current entering the grid could diffuse itself into the water from and between the wire nettings and establish a diffusion area around the light-ship. Experiments showed that, generally speaking, any two points on the water's surface, over this area, a hundred feet or so apart, would be at different electrical potentials and sufficient for practical telephonic purposes. The diffusion lines, whether due to leakage or induction, were sufficiently well distributed to produce operation of the telephone in any position of the ship, although differences in intensity were observed. Through the kindness of Hammond V. Hayes, Ph. D., chief electrician, American Bell Telephone Company, powerful low-resistance carbon transmitters were obtained, and measurements were made in the laboratory at the light-house station at Tompkinsville to determine the best conditions of action of these. Results beyond the requirements of the circuits to be employed are not recorded here. Several ampere-meters, including a Whitney reading to 5 amperes in twentieths, were all found to be wholly unreliable, as their impedance for rapid alterations was too great for low-resistance circuits. In fact, it was found that no form of coil amperemeter could be used. A hot-wire amperemeter was then devised and constructed. The accompanying cut, Pl. III, is a photograph of the same. It was calibrated with a Standard Weston Amperemeter. It was found that the greatest amount of energy obtainable by shouting or singing into the transmitter was about 1.5 to 2 watts, and the average strength of current through the carbon contacts about 2.2 amperes. The maximum energy that could be delivered to the submerged transformer over the line by these transmitters did not exceed 1 watt. The capacity of the transformers was about 100 times this. When used with the cable a suitable induction coil was interposed between the transmitter contacts and the cable.

However, with this small amount of energy available at the transformer (less than one seven-hundredth of a horsepower) there was found with the light-house tender *Gardenia*, which was suitably equipped with transmitting and receiving circuits, over 16 acres of water around the light-ship throughout which telephonic conversation could be carried on with Sandy Hook station and while under full steam. As the *Gardenia* has a wooden hull without sheathing, two plates of sheathing metal 7 by 3 feet were attached to bow and stern and wires run from them to the pilot house, as shown in the cut annexed, Pls. IV and V. The plates were about 113 feet apart, and sufficient potential difference existed over the 16 acres to operate well. Indeed, we were able from the *Gardenia* to talk with the light-ship or with the Sandy Hook station or to hear the conversation between the Hook and the light-ship while we were steaming about. The circuit upon the light-ship was made as follows: The two hawse pipes were connected together in the hold by a copper bar  $2\frac{1}{2}$  by  $\frac{1}{2}$  inches cross section, and extra plates put between the metallic sheathing of the ship and the hawse pipes outside to assure good connection through to the water. The circuit was then continued from the copper bar to the after cabin through a stranded insulated cable equivalent to No. 3/0 wire. Here it was connected with a telephone cupboard, which was bolted to the bulkhead in the cabin, and convenient supports against the rolling of the ship provided for the person using it. A similar cupboard was used at the shore end.

When the telephone was not in use the calling device was alone in circuit. The opening of the cupboard door cut out this device automatically and cut in the receiver. The receivers were of the watch form, made by the National Telephone Company of Boston, but were rewound by us to the best resistance, which was determined by an extended series of experiments both for the ship and the shore instruments. The ship's receivers were arranged in the form as shown in Pl. VII, which left the hands free for support against the ship's motions. A favorite shore form is also shown, Pl. VII, which combined transmitter and one receiver on one support. The transmitters were cut in only in sending. Both transmitters and receivers were used with induction coils. Much experimenting, both in the laboratory and on each end of the line, was done to determine not only the advantages of induction coils, but also the proper design and construction of the coils. A detailed account of the methods and apparatus used would be too extended for this report. Suffice it to say, open-circuit coils were selected; step up at the shore end, 900 turns No. 16 wire in the secondary; on the ship, step down, 40 turns No. 7 on the secondary.

From the cupboard in the cabin the stranded cable was continued to the after deck, thence along the underside of the main boom through a block at its end, and there dropped down to a submerged ground. This ground was devised to meet both the electrical and nautical requirements. Four 30-foot lengths of 3-inch manila rope were taken, and a strip 2 inches wide of sheathing metal wound spirally around each, with a quarter inch space between each turn. At each foot the metal was riveted through the rope. The four ropes were then connected in parallel at one end. Each rope became then a flexible conductor trailing from the boom end. The pulley block allowed them to be raised or lowered, as need be, and the slack was neatly coiled out of the way in cleats on the side of the after hatch. This tail piece has been in use now ten months, in all sorts of weather, never fouling, handled by the sailors, and coiled on the deck like any ordinary rope when not in use. This tail piece would generally tend the tide quite freely. The extreme distance between bow sheathing and the tail rope was about 120 feet. Experiment, however, showed that sufficient difference of electrical potential existed also between the bow and rudder sheathing, and even between the bow and stern sheathing, to operate the receiver, although of course not as well as between bow and tail ropes.

The laying of the grid in the winter season was a difficult task, but was successfully accomplished by the skill and excellent judgment of Capt. C. A. Ruland, of the steamer *Gardenia*, and now of the *John Rodgers*. Experimenting was begun in August,

*Appropriations made at the third session of the Fifty-third Congress for light-house purposes.*

Supplies of light-houses.....	\$385,000
Repairs of light-houses .....	490,000
Salaries of light-keepers.....	690,000
Expenses of light-vessels .....	285,000
Expenses of buoyage .....	415,000
Expenses of fog signals.....	70,000
Inspecting lights .....	3,000
Lighting rivers .....	300,000
Survey of light-house sites.....	1,000

**SPECIAL WORKS.**

Boston light-vessel, additional.....	35,000
Butler Flat, Massachusetts .....	45,000
Chequamegon Point light and fog-signal station, Wisconsin.....	10,000
Detroit River lights, Michigan, north and south ends of Grassy Island.....	6,700
Devils Island light and fog-signal station, Wisconsin.....	22,000
Eagle Harbor fog signal, Michigan .....	5,000
Grand Marais light-station, Michigan (making available).....	4,000
Grand Marais Harbor of Refuge, light and bell, Michigan.....	15,000
Grays Harbor light and fog-signal station, Washington.....	39,500
Kennebec River lights, Maine.....	17,000
Lower Cedar Point light-station, Potomac River, Maryland (with power to contract up to \$75,000).....	25,000
Manitowoc fog signal, Wisconsin.....	5,500
Maumee range light-station .....	20,000
Mendota light-station, Michigan .....	7,500
Mobile Ship Channel lights, Alabama.....	30,000
North Head light-station, Washington .....	25,000
North Manitou light and fog signal, Michigan.....	20,000
Oil houses for light-stations.....	5,000
Plum Beach light and fog-signal station, Rhode Island (with power to contract up to \$60,000).....	20,000
Portage Lake Ship Canal Pierhead fog signal, Michigan.....	5,500
Porte des Morts range lights and fog-signal station, Michigan.....	21,000
Sheboygan fog signal, Wisconsin.....	5,500
Smith Point light-house, Chesapeake Bay, Maryland (with power to contract up to \$80,000).....	25,000
South Fox Island fog signal, Michigan .....	5,500
Southwest Ledge fog signal, Connecticut.....	3,000
Spectacle Island range lights, Massachusetts.....	9,350
Spring Point Ledge light and fog signal, Maine (with power to contract up to \$45,000).....	20,000
Squaw Point light, Michigan.....	5,000
Staten Island light-house depot sea wall .....	25,000
Sturgeon Bay Canal light-station, Wisconsin.....	20,000
Tibbetts Point fog signal, New York .....	4,300
Umatilla Reef light-vessel, Washington (with power to contract up to \$80,000).....	40,000

**NEW WORKS AUTHORIZED.**

Congress authorized, by act approved on February 15, 1893, the establishment of a number of light-stations at an aggregated cost of nearly half a million dollars, but made no appropriation at that time for their



construction. Since then, from time to time, appropriation has been made for the erection of many of them. The following is a list of the light-stations remaining for which no appropriation has yet been made, with the maximum amount which each may cost:

Galloo Island fog signal, New York .....	\$5, 700
Carlton Island light-house, New York .....	8, 600
Bay State Shoal lights, New York .....	800
Erie Harbor (Presqu'île) fog signal, Pennsylvania .....	4, 300
Fairport Harbor fog signal, Ohio .....	4, 300
Lorain Harbor (Black River) fog signal, Ohio .....	4, 300
Port Clinton light, Ohio, reestablishing .....	1, 500
Poe Reef light-vessel, Straits of Mackinac, Michigan .....	25, 000
Big Sable Point fog signal, Michigan .....	5, 500
Sand Hills light-house, Michigan .....	20, 000
Bayfield light and fog signal, Wisconsin .....	5, 000
Pats (or Hat) Point light and fog signal, Minnesota .....	15, 000
Ludington light and fog-signal station, Michigan, keeper's dwelling .....	4, 500
St. Joseph fog signal, Michigan .....	5, 000
St. Martin Island light, Michigan .....	15, 000
Little Gull Island light and fog signal, Michigan .....	20, 000
Peshtigo Shoal, Green Bay, Wisconsin .....	10, 000
Wilson Harbor light, New York .....	2, 500
Big Oyster Bed Shoal light and fog signal, New Jersey .....	25, 000
Deer Point light, Florida .....	1, 000
New York Slough light and fog signal, California .....	10, 000
Mermonteau River light, Louisiana .....	7, 000
Willamette River, Oregon, 25 beacon lights and buoys between Salem and Portland .....	5, 000

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report, under specified headings, from which it will be evident that the Board has brought the numerous and varied aids to navigation under its charge up to the proper standard, and that it has done all that was possible, with the funds provided, to meet the requirements of commerce and navigation.

#### SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1895 was \$385,000. While the appropriation was the same as that of the previous year, the number of light-stations was increased, and it is reasonable to expect that appropriations will be made during the present session of Congress for still other light-stations.

The Board has found it impossible, with funds provided, to keep up its reserve stock of supplies with which to meet emergencies. This stock has been heavily drawn upon. The meagerness of preceding appropriations has made it necessary for the Board to cut down the quantity of supplies furnished yearly to the light-houses to such an extent that it can go no further without danger to the lights. In spite of the severe economy used, there is danger that the present lights and those which are being built can not be properly kept up without an

increase of appropriation. The passage of the eight-hour law has increased the price of the manufactured material used to supply light-houses. The Board therefore estimates that \$410,000 will be needed for providing supplies for light-houses during the coming fiscal year.

#### REPAIRS AND INCIDENTAL EXPENSES OF LIGHT-STATIONS.

The estimate submitted under this head is \$600,000. The appropriation for the current year is \$490,000. From this appropriation must be paid the cost of repairs and maintenance of all light-stations, numbering now some 1,014, many of which are very old, and therefore costly to maintain, as well as the cost of beacon lights to mark the ends of pierheads and at other localities on inland waterways and harbors. The law requires the Light-House Board to erect such beacon lights, but special estimates for this purpose can not be submitted in advance, since their erection usually depends upon the completion of piers and breakwaters, or the completion or progress of other works of improvement made by the Government to inland waterways. The cost of spare illuminating apparatus, which must be kept on hand to replace that which may be damaged or destroyed in service, is also paid from the appropriation for repairs and incidental expenses. Several estimates for special appropriations to make extensive renewals of buildings at light-stations have been omitted this year, since they can be done from the appropriation for general repairs if this is made sufficient. The amount asked is urgently needed for the efficient and economical maintenance of the service.

#### SALARIES OF LIGHT-HOUSE KEEPERS.

Last year Congress appropriated \$690,000 to pay the salaries of not exceeding 1,250 keepers. But 1,203 keepers were employed. In quite a number of instances the Board found itself unable to provide keepers for needed beacon lights which it had funds to build, and hence these lights were not established.

The statement made in the Board's last three annual reports in reference to this subject is repeated.

It has become necessary, in view of the great pressure on this appropriation, to temporarily omit filling certain vacancies as they occurred, where there was more than one keeper at a station. This has necessarily resulted in inferior service on the part of the overworked keepers remaining at those stations. Two men can not do the work of three properly for any extended term.

The duties of light-keepers have been greatly increased by the addition of steam fog-signal apparatus, requiring, in many cases, the attention of steam engineers. It has been found that it is impossible to obtain the services of men for many of these positions, for the pay offered, who hold certificates that they have passed examinations as steam engineers. Hence the Board has been unable to get the best results from its steam fog signals. The steam is not raised as soon as it might be so as to get the fog signal to sounding as soon as it should. The machinery gets out of order sooner than it would if in the charge of a skilled engineer. It remains out of use until a machinist is sent from a distant town at large expense in wages and

transportation to fix it, and the life of the machine is much shorter than it would be if in the charge of a certificated engineer. It is poor economy to stint the pay of engineers to such point that the services of only the poorest can be commanded, as it costs so much to remedy the mistakes they unavoidably make.

It has been found in practice that it is difficult to retain in the service men of sufficient experience and ability to operate and take the proper care of the delicate, complicated, and expensive illuminating apparatus placed in their charge. Hence it costs more than it formerly did, and more than it ought, to keep this apparatus in running order. The Board therefore suggests that it would be better, from an economical point of view, to raise the average salary of the light-keeper to the amount fixed by law rather than to maintain it at its present rate, and especially to decrease it still more.

The Board anxiously feels the difficulty with which it retains its trained and experienced light-keepers. The pay they receive is insufficient to induce them to remain in the service. During the four years between March 4, 1885, and March 4, 1889, 769 persons entered the service by original appointment. During the four years which elapsed between March 4, 1889, and March 4, 1893, 672 persons received original appointments into the Light-House Service. Each of these appointments was made to fill a vacancy made by cause. These causes were death, resignation, or removal. Each removal was made for specified written and recorded cause, and never for political reasons. The removals number, say, one in seven of all the vacancies. The vacancies caused by death are inconsiderable in number. The vacancies caused by resignation are, say, between five and six out of every seven.

Some of the light-stations are undermanned. At others, the more isolated, it is difficult to retain good men at the rates paid. The appropriations made do not permit the Board to pay the average rates allowed by law. But even on the present basis it is estimated that \$700,000 will be needed for salaries of light-keepers during the next fiscal year.

#### EXPENSES OF LIGHT-VESSELS.

Congress appropriated \$285,000 to defray the expenses of light-vessels during this fiscal year. The appropriation has been expended and many needed repairs go over to next year. The cost of the maintenance of the light-vessel which was established off Boston Bay, Massachusetts, in October, 1894, is to be defrayed by the appropriation for the coming year. The wear and tear on the older light-vessels was greater than usual, owing to their increased age. The Board estimates, therefore, that the expenses of light-vessels for the ensuing fiscal year will be \$350,000, and it is recommended that an appropriation of that amount be made therefor. Within the past two years the number of light-ships established has been increased by 33 per cent, but there has been no corresponding increase in appropriations necessary to meet the increased cost of maintenance.

#### EXPENSES OF BUOYAGE.

Congress at its last session appropriated \$415,000 for the expenses of buoyage during the current fiscal year. There are now some 4,725 buoys of all kinds in position. The buoys which were carried away or sunk at their moorings during the past year were replaced from the stock

held in reserve, and that reserve stock has not been replaced for lack of funds. The Board, therefore, will need a larger appropriation than usual, not only to meet the immediate wants of commerce, but to bring up its stock of reserve buoys to its normal condition. The Board was unable to place buoys at certain places for which request was made, not because it was unnecessary to do so, but because the appropriation therefor was insufficient. Funds are needed to maintain buoys after they are established. It is estimated that it will require \$500,000 to defray the expenses of buoyage during the coming year, and it is recommended that an appropriation of this amount be made therefor.

#### EXPENSES OF FOG SIGNALS.

The annual appropriation for this important part of the service has been \$70,000 for a number of years, notwithstanding that the number of fog signals has been constantly increasing by special appropriations made by Congress for new light and fog-signal stations, and by the establishment of fog signals at existing light-stations under the authority of law to meet the growing demands of commerce. The conditions are now such that it is impossible to maintain the service in a proper condition and to replace obsolete apparatus and make other urgently needed improvements at existing stations without increased appropriations for this purpose.

In the earlier development of sound signals for maritime purposes the United States led the world, and the majority of appliances now in general use for this purpose originated in this country and were first used by the Light-House Board. Important improvements have since been made, however, and many of them by officers in the Light-House Service of this country, which the Board has been unable to apply for lack of funds. Some of the improvements which are urgently needed and which could now be made are (1) more efficient quick-steaming boilers for stations using steam signals, to facilitate starting the signal when needed and to afford greater economy in operation; (2) compressed-air apparatus operated by oil engines for stations where the water supply is deficient; (3) improved striking apparatus to render fog bells more effective.

It is therefore again recommended that the appropriation for fog signals be made \$125,000.

#### LIGHTING OF RIVERS.

The appropriation of \$300,000 made at the last session of Congress was barely sufficient to maintain the post lights which had already been established. And it was insufficient to enable the Board to establish and maintain other lights which it is evident are much needed. It is estimated that \$350,000 will be required to defray the expenses of lighting rivers during the next fiscal year, and it is recommended that an appropriation of this amount be made therefor.

## NEW LIGHT-STATIONS AND DEPOTS.

The estimates for special appropriations for new light-stations and depots have been revised with particular care to bring them up to date and to make them conform to the actual needs of navigation in the various districts throughout the coast and inland waters. Several estimates formerly submitted for special appropriations to rebuild or renew existing structures have been omitted, as such work can be done more advantageously under the general appropriation for repairs, provided the latter be made sufficient, and the special estimates are thereby reduced to a minimum.

## NEW LIGHT-VESSELS.

The Board has recommended in the proper places in the body of this report that appropriations be made for building six new light-vessels. Each is much needed, but attention is especially invited to the urgent necessity for a relief light-vessel in the Fourth light-house district.

## NEW TENDERS.

Recommendation is repeated in certain of the following pages that appropriations be made for the construction of three steamers to be used as light-house tenders in the Second, Third, and Seventh light-house districts to replace old steamers now so nearly worn out that they can only last, if used with care, until new vessels can be built to take their places.

## OIL HOUSES.

The Board again recommends that appropriation be made for the erection of small, inexpensive structures near to, but separate from, light-houses, in which to keep a year's supply of mineral oil, the illuminant now used by the Light-House Establishment. Last year the Board estimated that \$15,000 could be expended with great advantage during the year among the larger, more isolated, and more important light-stations. An appropriation of \$5,000 was made for that purpose, which will be expended during the current year.

It is estimated that \$10,000 will be needed and can be profitably expended in building oil houses during the coming fiscal year, and the appropriation of that amount is therefore recommended.

The recommendation made in the annual report for each of the last nine years was accompanied by the following explanation:

The substitution of mineral oil for lard oil in the light-house service, which has been in progress several years, is now finished. As the quantity of the oil now used is larger, and as its bulk is greater than was that of the oil formerly used, and as the mineral oil is much more likely to occasion fire, and indeed to take fire, than was the lard oil, the Board has come to the conclusion, in the interest of safety, to advise that the proper steps be taken to have a house erected at each of the larger stations, from a plan specially devised after a careful study, for the purpose.

*Execution Rocks, Long Island Sound, New York.*—The easterly edge of the red sector was corrected December 8, 1894, to bear NE.  $\frac{1}{4}$  N. and guide clear of the south end of Hart Island.

*Coon Island post light, entrance to the Willamette River, Oregon.*—Changed December 18, 1894, from red to white.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from light-vessel No. 20, temporarily marking the station, to light-vessel No. 48; characteristic changed to two reflector lights, the one on the foremast showing a white flash every 30 seconds, and that on the mainmast showing fixed red; height decreased from 54 feet to 37 feet, January 15, 1895.

*Muskegon Pierhead, Lake Michigan, Michigan.*—Changed, January 16, 1895, to illuminate the entire horizon.

*Grant Farm (lower) post light, Indian River, Florida.*—Changed from white to red, the color of its day mark from black to red, and its number to 14 $\frac{1}{2}$ , January 31, 1895.

*Port Penn range (front), Delaware River, Delaware.*—Changed February 14, 1895, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed February 28, 1895, from fixed white varied by a white flash every 10 seconds, to fixed white varied by a white flash every 25 seconds.

*Cubits Gap post light, Mississippi River, Louisiana.*—Changed from fixed white to fixed red, March 1, 1895.

*Waackaack, New York Bay, New Jersey.*—Changed by the substitution of a third-order for the first-order lamp in each of the two range lenses, April 18, 1895.

*Sand Spit, Hudson River, New York.*—Exhibited from a new structure, a dolphin of five piles, May 2, 1895.

*Ahnapee Pierhead range (rear), Lake Michigan, Wisconsin.*—Changed, June 6, 1895, from a lens-lantern to a fifth-order light.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Changed, June 8, 1895, from the schooner *Drift* to light-vessel No. 46, from two lens-lantern to two reflector lights, and from 57 to 45 feet in height.

*Yaquina Bar range (rear) beacon, Yaquina Bay, Oregon.*—Height increased to 30 $\frac{1}{4}$  feet, June 18, 1895.

*Mahon River, Delaware Bay, Delaware.*—Changed, June 29, 1895, from fixed white to fixed white with a narrow fixed red sector between S. 26° 15' W. (SSW.  $\frac{3}{8}$  W.) and S. 31° 25' W. (SSW.  $\frac{1}{4}$  W.).

#### CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in fog signals:

*North Hook beacon, Sandy Hook, New Jersey.*—The characteristic of the siren was changed, November 30, 1894, to sound blasts of 3 seconds, separated by silent intervals of 27 seconds' duration.

weed moving on the bottom in the rapid tidal currents of Vineyard Sound repeatedly broke the slender cable employed, necessitating frequent underrunning and relaying, and no attempt was made to continue the communication after the inspection.

The following winter the Popes Island Manufacturing Corporation, of New Bedford, Mass., made for the writer a 5-fathom chain of one-half inch Howard metal, which is noncorrodible in sea water and whose electrical conductivity is about that of brass. This experimental chain, when submerged, conducted, so far as practical results are concerned, apparently as well as a continuous insulated cable. Unfortunately, to the present time no successful method is known of welding this metal into links sufficiently heavy for anchor purposes. Its tensile strength, as shown from tests at Watertown arsenal, is reported to be about 90,000 pounds to the square inch, and this property, coupled with its noncorrodibility, would make it of special value for light-vessel anchor chains, independently of its service in electrical communication. From the experiments of 1893 there is encouragement to believe that through the ship's anchor chain, and quite surely so if it be of noncorrosive metal, such as the Howard, telephone connection can be established by the above method, and such method would be the simplest possible for light-ships.

In the following summer (1894) experiments were made upon another method of telephoning to light-ships, and in the course of these, incidentally, an observation was made upon the above-described chain method. A submarine cable 5 miles long, which was in use for experiment, became fouled with the Scotland light-ship anchor chains. Its copper core came into metallic contact with the chain about 60 fathoms from the ship. A receiving telephone, which was connected with the hawse pipe of the ship and thereby directly with the anchor chain, became so loud as to be heard everywhere in the ship's cabin and indicated direct metallic connection through to the shore. To determine if this was the case, an insulated wire was then connected directly with the core of the cable and brought on board, and matters so arranged that the telephone could be alternately cut into the cable circuit either through the insulated wire or through the hawse pipe connection and anchor chain. No decisive difference in the loudness of the telephone could be detected. It seemed right to conclude, therefore, that the current passed through a portion of the anchor chain. Other experiments under way have precluded, to this time, further tests upon this chain method. Sufficient has been done, however, to encourage the belief that the anchor chain may be successfully used to complete electrically the cable circuit.

The second method, which has been alluded to as being experimented upon in 1894, will be designated the diffusion method. It, like the chain method, was devised by us to avoid bringing the end of a submarine cable from the sea bottom up on board ship. The anchor chain was not made part of the telephone circuit in this method, but the entire region of water in which the ship could swing was electrified in such a way by the telephone current as to present differences of potential at different points in its area sufficient for telephonic purposes. By order of your Board the experimental plant which was to test the method was located off Sandy Hook, N. J., a place convenient to the shops of the Department at Tompkinsville, and in ordinary weather easily accessible to the light-house tenders. The Scotland light-vessel was selected with which to establish communication. This was  $4\frac{1}{2}$  miles offshore, in 10½ fathoms mean low water. It was not the intention to establish permanent communication with this vessel, as communication at this point would not be of particular service to the Department.

The method in general was carried out in the following manner: An iron-armored submarine cable was laid from Sandy Hook, at the power station of the Gedney Channel Electric Buoy System, out to the Scotland light-ship, 5 statute miles, of which one-half mile was underground across the Hook. This cable terminated in a junction box on the sea bottom, about 900 feet from the mushroom mooring anchor of the light-ship. The location of the light-ship and the course of the cable are shown in the accompanying map, Pl. I. The cable was a portion of that used at the World's





However, with this small amount of energy available at the transformer (less than one seven-hundredth of a horsepower) there was found with the light-house tender *Gardenia*, which was suitably equipped with transmitting and receiving circuits, over 16 acres of water around the light-ship throughout which telephonic conversation could be carried on with Sandy Hook station and while under full steam. As the *Gardenia* has a wooden hull without sheathing, two plates of sheathing metal 7 by 3 feet were attached to bow and stern and wires run from them to the pilot house, as shown in the cut annexed, Pls. IV and V. The plates were about 113 feet apart, and sufficient potential difference existed over the 16 acres to operate well. Indeed, we were able from the *Gardenia* to talk with the light-ship or with the Sandy Hook station or to hear the conversation between the Hook and the light-ship while we were steaming about. The circuit upon the light-ship was made as follows: The two hawse pipes were connected together in the hold by a copper bar  $2\frac{1}{2}$  by  $\frac{1}{2}$  inches cross section, and extra plates put between the metallic sheathing of the ship and the hawse pipes outside to assure good connection through to the water. The circuit was then continued from the copper bar to the after cabin through a stranded insulated cable equivalent to No. 3/0 wire. Here it was connected with a telephone cupboard, which was bolted to the bulkhead in the cabin, and convenient supports against the rolling of the ship provided for the person using it. A similar cupboard was used at the shore end.

When the telephone was not in use the calling device was alone in circuit. The opening of the cupboard door cut out this device automatically and cut in the receiver. The receivers were of the watch form, made by the National Telephone Company of Boston, but were rewound by us to the best resistance, which was determined by an extended series of experiments both for the ship and the shore instruments. The ship's receivers were arranged in the form as shown in Pl. VII, which left the hands free for support against the ship's motions. A favorite shore form is also shown, Pl. VII, which combined transmitter and one receiver on one support. The transmitters were cut in only in sending. Both transmitters and receivers were used with induction coils. Much experimenting, both in the laboratory and on each end of the line, was done to determine not only the advantages of induction coils, but also the proper design and construction of the coils. A detailed account of the methods and apparatus used would be too extended for this report. Suffice it to say, open-circuit coils were selected; step up at the shore end, 900 turns No. 16 wire in the secondary; on the ship, step down, 40 turns No. 7 on the secondary.

From the cupboard in the cabin the stranded cable was continued to the after deck, thence along the underside of the main boom through a block at its end, and there dropped down to a submerged ground. This ground was devised to meet both the electrical and nautical requirements. Four 30-foot lengths of 3-inch manila rope were taken, and a strip 2 inches wide of sheathing metal wound spirally around each, with a quarter inch space between each turn. At each foot the metal was riveted through the rope. The four ropes were then connected in parallel at one end. Each rope became then a flexible conductor trailing from the boom end. The pulley block allowed them to be raised or lowered, as need be, and the slack was neatly coiled out of the way in cleats on the side of the after hatch. This tail piece has been in use now ten months, in all sorts of weather, never fouling, handled by the sailors, and coiled on the deck like any ordinary rope when not in use. This tail piece would generally tend the tide quite freely. The extreme distance between bow sheathing and the tail rope was about 120 feet. Experiment, however, showed that sufficient difference of electrical potential existed also between the bow and rudder sheathing, and even between the bow and stern sheathing, to operate the receiver, although of course not as well as between bow and tail ropes.

The laying of the grid in the winter season was a difficult task, but was successfully accomplished by the skill and excellent judgment of Capt. C. A. Ruland, of the steamer *Gardenia*, and now of the *John Rodgers*. Experimenting was begun in August,

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Staniford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Break-water light-station.

## BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

## TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.

"It was certain also that with the most efficient relay we could hope to obtain it would be necessary to employ a calling current of considerable power.

"The fact that a submerged transformer was included between the main cable of the system and the grid made it necessary to use alternate currents, and the safe capacity of this transformer being only about 75 to 100 watts at 125 cycles per second limited the 'shore to ship' calling current to that amount, unless a larger transformer was substituted. For many reasons such a change was not then advisable. The fact that the main cable had only one conductor made it necessary to use the same submerged transformer for both talking and calling.

"It is well known that transformers are generally most efficient at full load and very inefficient when the load is small. Hence a large transformer adapted for strong calling currents would probably be very inefficient for the weaker talking currents, and might seriously impair the talking efficiency of the system.

"These difficulties were anticipated to some extent in the first transformer, which was especially designed to work efficiently at small loads and was made as large as then seemed consistent with good results in the telephone.

"Now, when it is considered that the safe 'shore to ship' calling current was limited by the submerged transformer to about 100 watts; that sufficient funds were not available to equip the ship for 'ship to shore' work, and thus avoid the transformer difficulties; that the efficiency of the system was as low as 0.00004 per cent; that the relay which was to close the bell circuit must be operated by an almost infinitesimal current, and finally that this delicate relay must not be affected by the violent motion of the light-ship, it will be seen that there was a rare combination of serious obstacles to be overcome in perfecting the calling system.

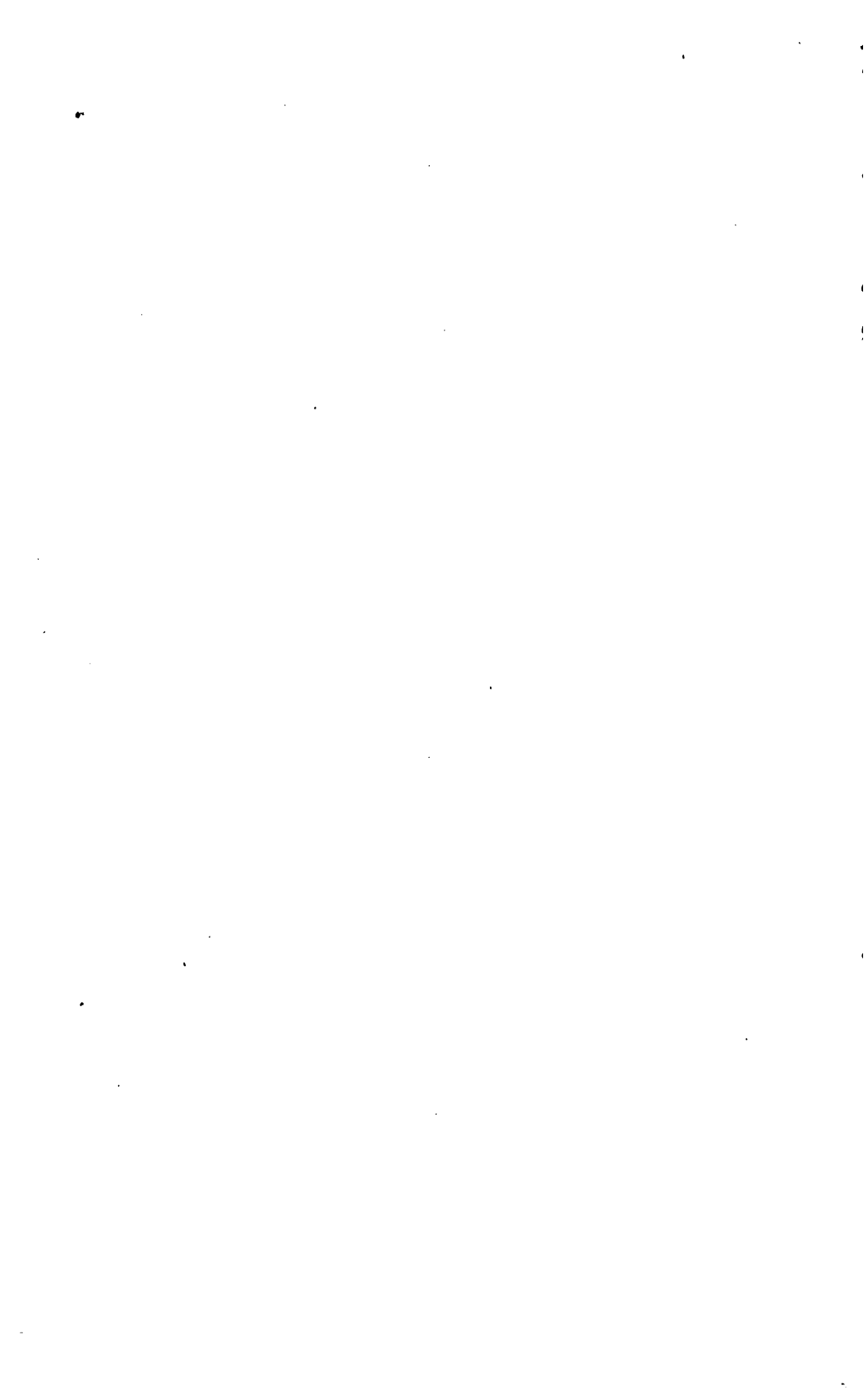
"Two general methods for solving this problem suggested themselves. In the first method, which for convenience may be called the synchronous method, a sending device would be provided capable of producing in the line alternating currents of a constant frequency such as would be produced by an induction coil whose primary circuit is opened and closed by the vibrations of a tuning fork. The receiving apparatus or relay for this system would be vibratory in character and tuned to a frequency of vibration to correspond with the period of the calling current. In addition to this mechanical adjustment, the electrical circuits might be adapted by the use of condensers and inductances to respond more readily to alternate currents of the same period.

"The action of such a system would be cumulative, i. e., each successive impulse of current would arrive just in time to increase the vibration in the relay until sufficient amplitude would be obtained to operate a circuit-closing device.

"There is no doubt that this principle furnishes the best possible method of producing a mechanical action with a very weak alternating current and that a simple and reliable relay of this kind could be made. The greatest objection to this system is on account of the great difficulty of producing powerful alternating currents of a perfectly constant period. Tuning forks with 'make and break' attachments are unsatisfactory for many reasons, but chiefly on account of the burning of contacts when strong currents are used. To drive a dynamo at a speed sufficiently constant for this system would be impracticable. A Tesla 'oscillator' might prove satisfactory.

"It was thought best therefore to begin work with what we called the nonsynchronous method. This method consists briefly in using a powerful 'sending' current of any convenient frequency and a relay whose operation is independent of the frequency of the calling current. This method permitted the use of any of the old and tried methods of producing alternating currents for calling, and the only serious difficulty was to make a successful relay.

"With a view to carrying out this method experiments were begun at once to perfect a suitable relay, and at the same time arrangements were made to get apparatus for producing the calling current. The instruments were necessarily crude, and adapted only for the experimental part of the work because funds were not available at the time.



- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

- Long Reach (upper) post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and light reestablished April 3, 1895.
- Pride Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 3; rebuilt and light reestablished April 3, 1895.
- Burnt House Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 8; rebuilt and light reestablished April 3, 1895.
- Execution Rocks light-station, westerly end of Long Island Sound, New York.*—Fog signal disabled and discontinued from March 9 to March 28, 1895.
- Nine-Mile Point post light, St. Johns River, Florida.*—Structure destroyed by fire and light shown from temporary stake March 25; structure rebuilt and light reestablished as before April 22, 1895.
- Hell Gate post light, East River, New York.*—Characteristic changed to fixed red above fixed white March 30; former characteristic restored April 18, 1895.
- Mouse Island (lower) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.
- Mouse Island (upper) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.
- Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—A gas-lighted buoy was established on either side of the mouth of the dredged channel April 4. West side buoy moved about 2 miles to southward and placed on east side of channel and east side buoy moved about 1 mile to southward May 15, 1895.
- Bath Dike post light, Hudson River, New York.*—Structure carried away by a freshet and light extinguished April 9; structure rebuilt and light reestablished April 11, 1895.
- Pleasure Island post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.
- Covells Folly post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.
- Green Flats post light, Hudson River, New York.*—Structure destroyed by freshet and light extinguished April 9; rebuilt and light reestablished May 1, 1895.
- Colt Pier range (front) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.
- Colt Pier range (rear) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.

*Sand Spit beacon light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 29, 1895.

*Roha Hook post light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 27, 1895.

*Nashua post light, St. Johns River, Florida.*—Structure knocked down by a tow and light extinguished April 10; light on temporary stake April 11; structure rebuilt and light reestablished as before April 21, 1895.

*East Haddam Meadows post light, Connecticut River, Connecticut.*—Discontinued from April 15 to April 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—Twenty-six lights established April 15 to remain one calendar month. Lights reestablished May 15, 1895, to remain until permanent system is established. Two additional temporary lights established May 16.

*Dog River Bar beacon light No. 1, Mobile Bay, Alabama.*—Changed from fixed red to fixed white April 15, 1895, to remain so during the existence of the temporary system of lighting Mobile Bay Dredged Channel.

*Choctaw Pass Channel range (rear) beacon No. 3, Mobile Bay, Alabama.*—Discontinued from April 15 to May 4, 1895.

*Press Barn Bar range (front) post light, Connecticut River Connecticut.*—Discontinued from April 17 to May 20, 1895, on account of the heavy freshets.

*Gedney and Bayside Range Cut Channels, entrance to New York Lower Bay, New York and New Jersey.*—An experimental system of ten electrically lighted spar buoys was established and operated during daylight from May 2 to July 1, 1895. At night the buoys were lighted with oil lanterns.

*Delaware Breakwater (east end) light-station, entrance to Delaware Bay, Delaware.*—The fog signal at this station was disabled from May 5 to May 9, 1895.

*South Pass light-vessel, No. 43, off South Pass entrance to the Mississippi River, Louisiana.*—Withdrawn from her station for the summer months May 18, 1895.

*Wreck of the Kate Kelly light, Lake Michigan, Michigan.*—A white lantern light established June 15, 1895. (Discontinued October 11, 1895.)

*Martins Industry light-vessel, No. 1, off Port Royal entrance, South Carolina.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 29, sounding a bell struck by hand instead of a steam fog signal, June 20, 1895. (Relief light-vessel No. 29 withdrawn and light-vessel No. 1 replaced August 20, 1895.)

### Fifth District.

extensive, and hence would involve greater expenditure than the establishment of the station on a new site sufficiently remote from the old one to be beyond any danger from erosion, while at the same time affording practically as effective a position for serving the needs of navigation.

Accordingly, in the Board's annual reports for 1889 and 1890 recommendation was made that an appropriation of \$150,000 be granted by Congress for the purpose of building a new light-station where it would not be exposed to danger. This amount was appropriated by act approved August 30, 1890. A location was selected nearly a mile in a westerly direction from the old site, and on February 13, 1891, the engineer of the district proposed that the new tower be built of iron and of the same design as that at Cape Henry, Virginia, erected in 1881. This is a conical structure, built of iron plates, and seemed to adapt itself to the requirement of rapid erection at the site, which is a necessity because of the short working season there. The Light-House Board, however, at its session on April 11, 1892, selected for the purpose a tower similar to that at Waackaack, New Jersey, or Southwest Pass, Louisiana, which, besides being much less expensive, it considered would be so different in appearance from the Cape Henry tower as to prevent any chance of its being mistaken by mariners for that light-house. It would also admit of a quick setting-up of the parts at the site.

The plans and specifications were prepared in the office of the Board. They were printed in April, 1893, and bids from iron manufacturers were received in May to furnish the metal work and deliver and erect at the respective sites, the towers for this and the Hog Island light-stations, it having been found desirable, for economical and other reasons, to have both towers identical and manufactured under the one contract.

The construction of the tower was begun at the contractor's shops in June, 1893. The first series of the ironwork, 27 feet in height of tower, was finished in November, 1893; the second series, 52 feet in height of tower, in January, 1894; the third, 75 feet in height of tower, in February; the fourth and fifth, 115 feet 9 inches of total height, in March; the sixth and seventh, 149 feet 6 inches of total height, in May, and the eighth (or last) series, 192 feet 7 inches total height, including the lantern, in August. Each series was completely erected separately, and after inspection by the agent of the Light-House Board, was taken apart and removed, in readiness for shipment to the site.

Meanwhile the preparation of the foundation to receive the tower had been commenced by the engineer's working party. This work was done as follows:

After the site had been properly marked off, an iron caisson, 21 feet in diameter, built of three-eighth-inch boiler iron, was erected in the center of the foundation area. The sand was excavated from the inside,



*Aids to navigation maintained by the Light-House Board, June 30, 1895.*

Aids.	First district.	Second district.	Third district.	Fourth district.	Fifth district.	Sixth district.	Seventh district.	Eighth district.	Ninth district.	Tenth district.	Eleventh district.	Twelfth district.	Thirteenth district.	Fourteenth district.	Fifteenth district.	Sixteenth district.	Atlantic coast.	Pacific coast.	Lake coast.	Western rivers.	Total entire coast, 1894.	Total entire coast, 1895.	Increase or decrease.
Electric lights.....																	2	18			2	2	2
First-order lights.....	2	4	6	5	6	7	8	2				9	9				40	15	3		56	58	2
Second-order lights.....	7	3	1			4	1	3	1		2	1	1				15	1			19	19	0
Third-order lights.....	6	1	5	3		4	5	8	3	6	8	3	1				27	4	22	7	52	53	1
Three-and-a-half-order lights.....							1				4						3				10	10	0
Fourth-order lights.....	19	23	38	13	41	7	6	13	32	23	32	10	7				157	17	90		266	264	-2
Fifth-order lights.....	24	16	20	7	22	4	1	14	14	6	14	5	2				105	7	37		148	149	1
Sixth-order lights.....	1	5	31	3	11	6	1	2	18	16	12	12					161	7	55		111	108	-3
Range lanterns.....	2	3	6	3	19	7	7	1	4	14	44	4	12				47	16	63		114	126	12
Range lenses.....			6	8	2												16				16	16	0
Reflectors.....		10		8	4	14		2		4							38		4		45	42	-3
Tubular and other lanterns.....	3	6	127	7	9	155	15	59	16	3	49	7	83	528	524	359	358	90	91	1,411	1,835	423	
Light-vessels in position.....		10	7	4	3	8		2	4	4	3		1				29	1	11		46	41	-5
Electric buoys.....			11														11				7	11	4
Gas buoys.....		4	3	2	1			2									12				9	12	3
Total lighted aids.....	64	88	262	63	118	208	44	103	100	76	168	39	115	528	524	359	911	154	333	1,411	2,780	2,859	79
Fog signals operated by steam or hot air.....	13	10	16	6	6	4	2		23	6	24	15	10				52	25	53		125	130	5
Fog signals operated by clockwork.....	17	10	50	7	63	3		11	7	3		4	3				180	10	15		255	265	10
Day beacons.....	103	73	40	5	10	50	36	13		1	1	49	42	2			330	91	1	2	412	424	12
Whistling buoys.....	11	12	5	4	1	6	3	4				12	8				46	20			66	66	0
Ball buoys.....	18	15	22	6	1	15	5	2		2		6	4				84	10	2		92	98	6
Other buoys.....	635	510	576	187	1,070	298	256	101	93	146	322	73	271				3,642	344	561		4,438	4,547	109
Total unlighted aids.....	797	630	709	215	1,158	374	300	132	123	155	353	162	338	2			4,314	500	632	2	5,319	5,448	129
Total number of aids.....	861	718	971	278	1,276	582	344	235	223	231	521	201	453	530	524	359	5,225	654	1,015	1,413	8,099	8,307	208

*Appropriations made at the third session of the Fifty-third Congress for light-house purposes.*

Supplies of light-houses.....	\$385, 000
Repairs of light-houses .....	490, 000
Salaries of light-keepers .....	690, 000
Expenses of light-vessels .....	285, 000
Expenses of buoyage .....	415, 000
Expenses of fog signals.....	70, 000
Inspecting lights .....	3, 000
Lighting rivers .....	300, 000
Survey of light-house sites.....	1, 000

**SPECIAL WORKS.**

Boston light-vessel, additional.....	35, 000
Butler Flat, Massachusetts .....	45, 000
Chequamegon Point light and fog-signal station, Wisconsin .....	10, 000
Detroit River lights, Michigan, north and south ends of Grassy Island.....	6, 700
Devils Island light and fog-signal station, Wisconsin.....	22, 000
Eagle Harbor fog signal, Michigan .....	5, 000
Grand Marais light-station, Michigan (making available).....	4, 000
Grand Marais Harbor of Refuge, light and bell, Michigan.....	15, 000
Grays Harbor light and fog-signal station, Washington.....	39, 500
Kennebec River lights, Maine.....	17, 000
Lower Cedar Point light-station, Potomac River, Maryland (with power to contract up to \$75,000).....	25, 000
Manitowoc fog signal, Wisconsin.....	5, 500
Maumee range light-station .....	20, 000
Mendota light-station, Michigan .....	7, 500
Mobile Ship Channel lights, Alabama.....	30, 000
North Head light-station, Washington.....	25, 000
North Manitou light and fog signal, Michigan.....	20, 000
Oil houses for light-stations.....	5, 000
Plum Beach light and fog-signal station, Rhode Island (with power to contract up to \$60,000) .....	20, 000
Portage Lake Ship Canal Pierhead fog signal, Michigan.....	5, 500
Porte des Morts range lights and fog-signal station, Michigan .....	21, 000
Sheboygan fog signal, Wisconsin.....	5, 500
Smith Point light-house, Chesapeake Bay, Maryland (with power to contract up to \$80,000) .....	25, 000
South Fox Island fog signal, Michigan .....	5, 500
Southwest Ledge fog signal, Connecticut.....	3, 000
Spectacle Island range lights, Massachusetts.....	9, 350
Spring Point Ledge light and fog signal, Maine (with power to contract up to \$45,000) .....	20, 000
Squaw Point light, Michigan.....	5, 000
Staten Island light-house depot sea wall .....	25, 000
Sturgeon Bay Canal light-station, Wisconsin .....	20, 000
Tibbetts Point fog signal, New York .....	4, 300
Umatilla Reef light-vessel, Washington (with power to contract up to \$80,000).....	40, 000

**NEW WORKS AUTHORIZED.**

Congress authorized, by act approved on February 15, 1893, the establishment of a number of light-stations at an aggregated cost of nearly half a million dollars, but made no appropriation at that time for their

construction. Since then, from time to time, appropriation has been made for the erection of many of them. The following is a list of the light-stations remaining for which no appropriation has yet been made, with the maximum amount which each may cost:

Galloo Island fog signal, New York.....	\$5, 700
Carlton Island light-house, New York.....	8, 600
Bay State Shoal lights, New York.....	800
Erie Harbor (Presqu'île) fog signal, Pennsylvania.....	4, 300
Fairport Harbor fog signal, Ohio.....	4, 300
Lorain Harbor (Black River) fog signal, Ohio.....	4, 300
Port Clinton light, Ohio, reestablishing.....	1, 500
Poe Reef light-vessel, Straits of Mackinac, Michigan.....	25, 000
Big Sable Point fog signal, Michigan.....	5, 500
Sand Hills light-house, Michigan.....	20, 000
Bayfield light and fog signal, Wisconsin.....	5, 000
Pats (or Hat) Point light and fog signal, Minnesota.....	15, 000
Ludington light and fog-signal station, Michigan, keeper's dwelling.....	4, 500
St. Joseph fog signal, Michigan.....	5, 000
St. Martin Island light, Michigan.....	15, 000
Little Gull Island light and fog signal, Michigan.....	20, 000
Peshtigo Shoal, Green Bay, Wisconsin.....	10, 000
Wilson Harbor light, New York.....	2, 500
Big Oyster Bed Shoal light and fog signal, New Jersey.....	25, 000
Deer Point light, Florida.....	1, 000
New York Slough light and fog signal, California.....	10, 000
Mermonteau River light, Louisiana.....	7, 000
Willamette River, Oregon, 25 beacon lights and buoys between Salem and Portland.....	5, 000

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report, under specified headings, from which it will be evident that the Board has brought the numerous and varied aids to navigation under its charge up to the proper standard, and that it has done all that was possible, with the funds provided, to meet the requirements of commerce and navigation.

#### SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1895 was \$385,000. While the appropriation was the same as that of the previous year, the number of light-stations was increased, and it is reasonable to expect that appropriations will be made during the present session of Congress for still other light-stations.

The Board has found it impossible, with funds provided, to keep up its reserve stock of supplies with which to meet emergencies. This stock has been heavily drawn upon. The meagerness of preceding appropriations has made it necessary for the Board to cut down the quantity of supplies furnished yearly to the light-houses to such an extent that it can go no further without danger to the lights. In spite of the severe economy used, there is danger that the present lights and those which are being built can not be properly kept up without an

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Stanford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Break-water light-station.

## BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

## TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.

- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.

*Cape San Blas light, Gulf coast of Florida.*—Extinguished during the gale of October 8 and 9, 1894, owing to the undermining of the tower and carrying away of part of the station.

*Cornfield Point light-vessel, No. 51, Long Island Sound, Connecticut.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 20, showing a fixed white reflector light instead of an occulting electric light, and sounding a bell struck by hand instead of a steam fog signal, November 8, 1894. Relief light-vessel No. 20 broke adrift from her moorings November 16, and was replaced November 21, 1894. Light-vessel No. 20 withdrawn and permanently replaced by light-vessel No. 48, January 15, 1895. Steam fog signal disabled and bell struck by hand January 26, 1895. Steam fog signal repaired and put into operation February 17, 1895.

*Point Conception light-station, seacoast of California.*—Characteristic of fog signal modified owing to scarcity of water November 8, 1894. Characteristic of signal reestablished December 13, 1894.

*Key West light-station, Florida.*—Third-order light extinguished and lens-lantern light, without red sectors, substituted November 30, 1894, to remain during the work of increasing height of tower. Third-order light with red sectors reestablished and temporary light extinguished February 5, 1895.

*Bar Point light-vessel, No. 59, mouth of Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 9, 1895.

*Limekiln Crossing light-vessel (south), No. 64, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Limekiln Crossing light-vessel (north), No. 65, Detroit River Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Ballard Reef light-vessel, No. 63, Detroit River, Michigan.*—Withdrawn from her station for the winter December 11, 1894. Replaced April 10, 1895.

*Lake Huron light-vessel, No. 61, Lake Huron, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April, 1895.

*Poe Reef light-vessel, No. 62, easterly entrance to the Straits of Mackinac, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 21, 1895.

*Simmons Reef light-vessel, No. 55, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 10, 1894. Replaced April 24, 1895.

*White Shoal light-vessel, No. 56, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.

- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

*Conch Bar post light, No. 36, Indian River, Florida.*—A tubular-lantern light, January 31, 1895.

*Solomons Lump, Chesapeake Bay, Maryland.*—A lens-lantern light, February 22, 1895. (Wreck of structure carried away by ice.)

*Venus Point range (front), entrance to Savannah River, South Carolina.*—A reflector light, March 18, 1895.

*Maumee outer range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.

*Maumee middle range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.

*Maumee inner range, Maumee Bay, Ohio.*—Two sixth-order lights, opening of navigation, 1895.

*Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—A lantern light, May 4, 1895.

*Orange Park post light, No. 38, St. Johns River, Florida.*—A tubular-lantern light, May 10, 1895.

#### FOG SIGNAL DISCONTINUED.

During the fiscal year the following-named fog signal was discontinued:

*Trinity Shoal light-vessel, No. 43, Gulf of Mexico, Louisiana.*—A 12-inch steam whistle, August 15, 1894.

#### CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

*Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—Changed July 6, 1894, from a tubular-lantern to a lantern light.

*New Channel range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from tubular-lantern to lens-lantern lights. Height of front and rear lights increased, respectively, to 20 feet and 38 feet.

*Smith Island range post lights, Cape Fear River, North Carolina.*—Changed July 10, 1894, from lens-lantern to lantern lights. Height of front and rear lights increased, respectively, 2 feet and 3 feet.

*Maumee Bay ranges, Maumee Bay, Ohio.*—Luminous intensity of lights increased July 20, 1894, by changing the front and east lights from reflector to lens-lantern lights, and the west light from a reflector to a lantern light.

*Muskegon Pierhead range (front), Lake Michigan, Michigan.*—Changed July 21, 1894, from a tubular-lantern light to a lantern light.

*Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Changed from light-vessel No. 54 to light-vessel No. 58, July 26, 1894.



- Barlow Point post light, Columbia River, Washington.*—Changed September 8, 1894, from a cluster of piles to an arm on a tree.
- La Du post light, Columbia River, Washington.*—Changed from fixed red to fixed white, September 8, 1894.
- St. Helens Jetty post light, Columbia River, Washington.*—Changed from fixed red to fixed white, and from a framework to a gallows frame, September 8, 1894.
- Cherry Island range (front), Delaware River, Delaware.*—Changed September 20, 1894, from fixed to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Waackaack (main channel range, rear), New York Bay, New Jersey.*—Changed to a new structure, height increased from 76 to 101½ feet, and luminous intensity increased by changing to a second-order range lens, October 25, 1894.
- Finns Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- New Castle range (front) Delaware River, Delaware.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Deep Water Point range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Schooner Ledge range (front), Delaware River, Pennsylvania.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Billingsport range (front), Delaware River, New Jersey.*—Changed October 31, 1894, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.
- Rock Island, St. Lawrence River, New York.*—Height increased to 45 feet in October, 1894.
- Beacon 1 post light, Columbia River, Oregon.*—Changed December 1, 1894, from red to white.
- Sandy Hook light-vessel, entrance to New York Bay, New York.*—Changed from light-vessel No. 48 to light-vessel No. 51; characteristic changed from one flashing red and one fixed red reflector light to one fixed white electric light, shown simultaneously from a group of four lens lanterns, during periods of 12 seconds' duration separated by an eclipse of 3 seconds' duration; height increased from 37 feet to 54 feet, December 5, 1894.
- Scotland light-vessel, No. 7, entrance to New York Bay, New Jersey.*—Changed December 5, 1894, from two fixed white to two fixed red lights.
- Ram Island Reef light-vessel, Fishers Island Sound, New York.*—Changed December 8, 1894, from light-vessel No. 19 to light-vessel No. 23, having a red instead of a straw-colored hull, and black instead of red day marks at the mastheads.

*Execution Rocks, Long Island Sound, New York.*—The easterly edge of the red sector was corrected December 8, 1894, to bear NE.  $\frac{1}{4}$  N. and guide clear of the south end of Hart Island.

*Coon Island post light, entrance to the Willamette River, Oregon.*—Changed December 18, 1894, from red to white.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from light-vessel No. 20, temporarily marking the station, to light-vessel No. 48; characteristic changed to two reflector lights, the one on the foremast showing a white flash every 30 seconds, and that on the mainmast showing fixed red; height decreased from 54 feet to 37 feet, January 15, 1895.

*Muskegon Pierhead, Lake Michigan, Michigan.*—Changed, January 16, 1895, to illuminate the entire horizon.

*Grant Farm (lower) post light, Indian River, Florida.*—Changed from white to red, the color of its day mark from black to red, and its number to 14 $\frac{1}{2}$ , January 31, 1895.

*Port Penn range (front), Delaware River, Delaware.*—Changed February 14, 1895, from fixed white to fixed white during periods of 2 seconds, separated by an eclipse of 1 second's duration.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed February 28, 1895, from fixed white varied by a white flash every 10 seconds, to fixed white varied by a white flash every 25 seconds.

*Cubits Gap post light, Mississippi River, Louisiana.*—Changed from fixed white to fixed red, March 1, 1895.

*Waackaack, New York Bay, New Jersey.*—Changed by the substitution of a third-order for the first-order lamp in each of the two range lenses, April 18, 1895.

*Sand Spit, Hudson River, New York.*—Exhibited from a new structure, a dolphin of five piles, May 2, 1895.

*Ahnapee Pierhead range (rear), Lake Michigan, Wisconsin.*—Changed, June 6, 1895, from a lens-lantern to a fifth-order light.

*Smith Point light-vessel, Chesapeake Bay, Virginia.*—Changed, June 8, 1895, from the schooner *Drift* to light-vessel No. 46, from two lens-lantern to two reflector lights, and from 57 to 45 feet in height.

*Yaquina Bar range (rear) beacon, Yaquina Bay, Oregon.*—Height increased to 30 $\frac{1}{4}$  feet, June 18, 1895.

*Mahon River, Delaware Bay, Delaware.*—Changed, June 29, 1895, from fixed white to fixed white with a narrow fixed red sector between S. 26° 15' W. (SSW.  $\frac{3}{8}$  W.) and S. 31° 25' W. (SSW.  $\frac{1}{4}$  W.).

#### CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in fog signals:

*North Hook beacon, Sandy Hook, New Jersey.*—The characteristic of the siren was changed, November 30, 1894, to sound blasts of 3 seconds, separated by silent intervals of 27 seconds' duration.

*Sandy Hook light-vessel, entrance to New York Bay, New York.*—The 12-inch steam whistle was changed, December 5, 1894, to sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds.

*Wolf Trap, Chesapeake Bay, Virginia.*—Changed, January 7, 1895, from a bell struck by hand to a Daboll trumpet sounding blasts of 3 seconds' duration, separated by silent intervals of 7 seconds.

*Cornfield Point light-vessel, Long Island Sound, Connecticut.*—Changed from a 12-inch to a 10-inch steam whistle, and from blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, to blasts of 3 seconds' duration, separated by alternate silent intervals of 1 second and 30 seconds, January 15, 1895.

*St. George Reef, off the seacoast of California.*—Changed, March 1, 1895, to sound blasts of 5 seconds' duration, separated by silent intervals of 75 seconds.

*Fort Gratiot, Lake Huron, Michigan.*—Changed, April 8, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 17 seconds.

*Buffalo Breakwater (north end), Lake Erie, New York.*—Changed, June 1, 1895, to sound blasts of 3 seconds' duration, separated by silent intervals of 57 seconds.

*Avery Rock, Machias Bay, Maine.*—Changed, June 20, 1895, from a blow every 11 seconds to a blow every 10 seconds.

*Pond Island, mouth of the Kennebec River, Maine.*—Changed, June 20, 1895, from a blow every  $8\frac{1}{2}$  seconds to a blow every 10 seconds.

#### CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

*Grand Haven Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 6, 1894, 278 feet nearer the outer end of the south pier.

*New Channel range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 320 feet NNW.  $\frac{3}{8}$  W., from its former position.

*New Channel range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, 350 feet NNW.  $\frac{1}{4}$  W., from its former position.

*Smith Island range (front) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 1,600 feet W.  $\frac{5}{8}$  N. from its former position.

*Smith Island range (rear) post light, Cape Fear River, North Carolina.*—Moved, July 10, 1894, about 2,100 feet NW.  $\frac{1}{8}$  W. from its former position.

*Muskegon Pierhead range (front) light, Lake Michigan, Michigan.*—Moved, July 20, 1894, 323 feet nearer the outer end of the south pier.

- Cape Canaveral light, seacoast of Florida.*—Moved, July 25, 1894, 5,200 feet S.  $87^{\circ} 24'$  W. (W.  $\frac{1}{4}$  S.) from its former position.
- Nantucket New South Shoal light-vessel, off Nantucket Shoals, Massachusetts.*—Moved, July 26, 1894, a little to the southward and westward.
- Northeast End light-vessel No. 44, off the seacoast of New Jersey.*—Moved, September 1, 1894, about 2 miles E.  $\frac{3}{4}$  S. from her former moorings.
- Five-Fathom Bank light-vessel No. 40, off the seacoast of New Jersey.*—Moved, September 1, 1894, about  $1\frac{3}{4}$  miles SE. by S. from her former moorings.
- Barlow Point post light, Columbia River, Washington.*—Moved, September 8, 1894, about 1,400 feet WNW. from its former position.
- Scotch Cap post light, Thames River, Connecticut.*—Moved, September 10, 1894, from the west bank of the river S. by E. to a location in 6 feet of water.
- Marquette Breakwater light, Lake Superior, Michigan.*—Moved, October 1, 1894, about 1,000 feet to the outer end of the extended breakwater.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 7, 1894, northwesterly, along the range line, 20 feet from its former position.
- Waackaack (main channel range, rear) light, New York Bay, New Jersey.*—Moved, October 25, 1894, 52 feet westerly, along the main channel range, to the position occupied previous to November, 1892.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Moved, October 29, 1894, northwesterly, along the range line, 20 feet from its former position.
- Fort Mifflin fog signal, Delaware River, Pennsylvania.*—Moved, November 19, 1894, from the dock to the parapet back of the dock at Fort Mifflin.
- Kewaunee Pierhead range (rear) light, Lake Michigan, Wisconsin.*—Moved November 2, 1894, 300 feet nearer the outer end of the north pier.
- Winter Point range (rear) light, St. Marys River, Michigan.*—Moved, November 3, 1894, to a point on the westerly prolongation of the range line 675 feet in rear of the front light.
- Twin River Point light, Lake Michigan, Wisconsin.*—Moved November 19, 1894, to a new tower, located 47 feet S.  $68^{\circ} 30'$  W. (WSW.  $\frac{1}{4}$  W.) from the former tower.
- Salisbury Beach range lights, entrance to Newburyport Harbor, Massachusetts.*—Moved, November 20, 1894, about one-fourth mile NNE. from their former location, to mark the line of best water across the bar.

*Beacon 1 post light, Columbia River, Oregon.*—Moved, December 1, 1894, into 14 feet of water about five-eighths mile westerly from its former position.

*South Pass light-vessel, No. 43, off South Pass, entrance to the Mississippi River, Louisiana.*—Moved, December 3, 1894, into 82 feet of water about 1 mile NE. from her former moorings.

*Cubits Gap post light, Mississippi River, Louisiana.*—Moved, January 1, 1895, about one-third mile up the river and exhibited from the fog-bell tower at a height of 35 feet.

*Smith Point post light, Columbia River, Oregon.*—Moved, January 1, 1895, to a stake on the railway trestle off the point.

*Micco post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure about 1 mile to the southward and eastward of Grant Farm.

*St. Lucie post light, Indian River, Florida.*—Moved, January 31, 1895, to a new structure nearly five-eighths mile W.  $\frac{1}{2}$  N. from its former location.

*North Narrows post light, Indian River, Florida.*—Moved, January 31, 1895, about three-eighths mile NNW. of its former location.

*Barlow Point range (front) post light, Columbia River, Washington.*—Moved, February 8, 1895, to a new structure.

*Fairport Pierhead range (front) light, Lake Erie, Ohio.*—Moved, February 1, 1895, 122 feet to the southward of its former location.

*Grosse Isle South Channel range lights, Detroit River, Michigan.*—On March 30, 1895, the front and rear lights of this range were reestablished, each in a new structure, and the heights changed, respectively, to 30 feet and 50 feet above the level of the river.

*Lake Huron light-vessel, No. 61, off the entrance to the St. Clair River, Michigan.*—Moved, on the opening of navigation 1895, to a position 9,125 feet N.  $19^{\circ} 53'$  E. (N.  $\frac{3}{4}$  E.) from Fort Gratiot light-house.

*Grand Haven Pierhead light, Lake Michigan, Michigan.*—Moved, May 4, 1895, 511 feet nearer the outer end of the south pier.

#### NEW BUOYS.

During the fiscal year the following-named special buoys were established:

*Trinity Shoal, Gulf coast of Louisiana.*—A bell buoy, August 15, 1894.

*Lloyd Point, Shoal, off Lloyd Neck, Long Island Sound, New York.*—A bell buoy, September 13, 1894.

*Sewell Point, Hampton Roads, Virginia.*—A bell buoy, September 19, 1894.

*Baker Shoal, Delaware River, New Jersey.*—A gas-lighted buoy, September 29, 1894.

*Bishop Rock Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, October 19, 1894.

- Wreck of steamer Alleghany, Delaware Bay, New Jersey.*—A gas-lighted buoy, November 7, 1894.
- Hetzel Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Plum Beach Shoal, Narragansett Bay, Rhode Island.*—A bell buoy, March 1, 1895.
- Outer Entrance, Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Horn Island Pass, Mississippi Sound, Mississippi.*—A whistling buoy, April 18, 1895.
- Green Island Seal Ledges, off West Penobscot Bay, Maine.*—A whistling buoy, April 20, 1895.
- Tangier Island Shoal Lump, Chesapeake Bay, Virginia.*—A gas-lighted buoy, May 1, 1895.
- Staniford Ledge, Portland Harbor, Maine.*—A bell buoy, June 24, 1895. This buoy is operated electrically from Portland Break-water light-station.

## BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

- South Pass, off South Pass entrance to the Mississippi River, Louisiana.*—A whistling buoy, November 5, 1894.
- Sewell Point, Hampton Roads, Virginia.*—A bell buoy, January, 1895.
- Fox Rock (Orford Reef), off the seacoast of Oregon.*—A whistling buoy, January 30, 1895.
- Ohio Shoal, off Cape Canaveral, Florida.*—A whistling buoy, January 31, 1895.
- Cape Charles, entrance to Chesapeake Bay, Virginia.*—A whistling buoy, April 2, 1895.
- Mid-channel, easterly entrance to Nantucket Sound, Massachusetts.*—A bell buoy, May, 1895.

## TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

- Connors Point range (front) post light, Superior Bay, Minnesota.*—Carried away by a tug July 3, 1894. Reestablished July 20, 1894.
- Smith Island, Strait of Juan de Fuca, Washington.*—Lens-lantern light shown from July 5 to July 15, 1894, during repairs to regular illuminating apparatus.
- Northeast End light-vessel, No. 44, off seacoast of New Jersey.*—Withdrawn from her station for repairs and replaced by whistling buoy July 25, 1894. Light-vessel replaced and whistling buoy withdrawn August 5, 1895.

- Fenwick Island Shoal light-vessel, No. 52, off seacoast of Maryland.*—Withdrawn from her station for repairs and replaced by a whistling and a bell buoy August 5, 1894. Light-vessel replaced and buoys withdrawn August 12, 1894.
- St. George Reef light-station, off seacoast of California.*—Characteristic of fog signal changed, owing to scarcity of water, September 1, 1894. Working of fog signal still further reduced November 10. Characteristic of signal reestablished November 26, 1894.
- Grosse Isle South Channel, Detroit River, Michigan.*—Rear structure blown down and temporary structure erected September 3, 1894. Height of both lights reduced on same date.
- Columbia River light-vessel, No. 50, off entrance to Columbia River, Oregon.*—Withdrawn from her station for repairs and replaced by a buoy August 22, 1894. Light-vessel replaced and buoy withdrawn September 5, 1894.
- Wreck of the "George Hurst" light, New York Harbor, New York.*—Fixed red lantern light established on wreck September 12, 1894, and discontinued September 14, 1894, the wreck having been removed.
- Beaver Island light-station, Lake Michigan, Michigan.*—Fog signal disabled September 12 and repaired September 21, 1894.
- St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.*—Shifted out of position by collision with the schooner *H. A. Hagood* September 23; was replaced in position October 13, 1894.
- Batton Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Great Marsh Island Shoal post light, St. Johns River, Florida.*—The structure was destroyed and the light extinguished September 26. It was rebuilt and the light reestablished December 8, 1894.
- Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.*—The beacon was carried away and the light extinguished September 27, and on the next day the light was reestablished.
- Marquette Breakwater light, Lake Superior, Michigan.*—Changed to a fixed lantern light for a short time in September, 1894, during the removal of the tower to the outer end of the extended breakwater.
- Cape Charles light-vessel, No. 49, off the entrance to Chesapeake Bay, Virginia.*—Broke adrift from her moorings in the gale of September 28, and replaced on her station October 4, 1894.
- Salisbury Beach range (front) light, entrance to Newburyport Harbor, Massachusetts.*—Carried away in the storm October 1, and reestablished October 7, 1894.

**Sixth District.**

light would more than compensate for the one discontinued at Federal Point. It may be proper to add that there is no first-order light-house between Cape Lookout, North Carolina, and Cape Romain, South Carolina, a distance of about 170 nautical miles. Recent changes in the lighting of the entrance to the Cape Fear River have almost eliminated the Cape Fear light-house (Bald Head) as a harbor light. Its only use is that of a rear beacon to a stake light forming a range to guide up the river after crossing the bar. Upon the establishment of the proposed new light on the pitch of Cape Fear the old light might be discontinued, as the tower and the keeper's dwelling are antiquated and discreditable to the Light-House Establishment.

Urgent petitions have been presented to the Light-House Board by commercial and pilot associations of Wilmington, N. C., and by shipmasters trading to that port, which have had its careful consideration and approval.

It is estimated that a tower 150 feet high, with suitable oil room, keeper's dwellings, and outbuildings, on the pitch of Cape Fear, will cost \$70,000, and it is recommended that this amount be appropriated therefor.

— *Oak Island, mouth of Cape Fear River, North Carolina.*—During the year this station was discontinued, changes in the channel at the entrance to the Cape Fear River, North Carolina, having rendered its lights useless as guides. The illuminating apparatus and other valuable material were taken to Charleston and stored for future use.

561-577. *Cape Fear River post lights, North Carolina.*—These lights were well attended. During the year the shoaling of Snows Marsh Cut made it necessary, in order to get the cotton ships to sea, to make a new cut from that cut to deeper water. If this new cut becomes permanent it will have to be widened, and that on one side only. Under these circumstances temporary post lights were established.

— *Range lights for new dredged channels in the Cape Fear River, North Carolina.*—The following recommendation, made in the Board's last three annual reports, is renewed:

The Board recommended the discontinuance of 10 of the present post lights in the upper part of the Cape Fear River, and the establishment of 24 new post lights, which, in connection with certain other ranges already established, would constitute a system of ranges to guide vessels from the Cape Fear entrance to Wilmington, N. C., through channels dredged to a depth of 20 feet at mean low water. As vessels are now carried by ranges one-half the distance between the entrance and Wilmington, and then left without further adequate guidance, the Board is of opinion that to complete the usefulness of the aids to navigation in the lower part of the river similar aids should be provided to guide them to their port of destination. It is estimated that this can be done at a cost not to exceed \$3,105, and it is recommended that an appropriation of that amount be made for this purpose.

These channels have already been dredged to the depth of 18 feet.

— *Georgetown Harbor lights, South Carolina.*—Six beacons, consisting each of a triangular pyramidal structure of three piles, carrying a square day mark and to be mounted with Funck lanterns illuminating the entire horizon, and with focal plane of 13 feet above mean high water, were constructed during the year but have not yet been lighted.



- Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—Withdrawn from her station for the winter December 12, 1894. Replaced April 20, 1895.
- Eleven-Foot Shoal light-vessel, No. 60, Green Bay, Michigan.*—Withdrawn from her station for the winter December 7, 1894. Replaced April 19, 1895.
- Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.*—Withdrawn from her station for the winter December 26, 1894. Replaced April 10, 1895.
- Moosabec Reach light, easterly entrance to the reach, Maine.*—Discontinued for the winter December 28, 1894. Reestablished March 22, 1895.
- Crescent Lake post light, St. Johns River, Florida.*—Structure burned and light displayed from the remains January 24. Structure rebuilt and light displayed as usual February 14, 1895.
- Browns Head light, westerly entrance to Fox Islands Thoroughfare, Maine.*—Extinguished February 7, owing to the closing of the thoroughfare by ice, and relighted February 21, 1895.
- Lawrence Point Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 7. Structure rebuilt and light reestablished May 3, 1895.
- Wreck of John C. Haynes light, Hampton Roads, Virginia.*—Established to mark the wreck February 9; discontinued February 19, 1895.
- South Brother Island Ledge post light, East River, New York.*—Structure carried away by ice and light extinguished February 10. Structure rebuilt and light reestablished May 3, 1895.
- Bush Bluff light-vessel, Elizabeth River, Virginia.*—Light-house tender *Holly*, used as a light-vessel, having been carried away by ice two days in succession, was withdrawn from the station February 13, and replaced by the schooner *Drift* February 18, 1895. Schooner *Drift* withdrawn from the station and the *Holly* replaced March 5, 1895.
- Smith Point light-station, mouth of Potomac River, Chesapeake Bay, Virginia.*—Carried away by ice; light and fog signal discontinued February 14, 1895.
- North River light-station, Albemarle Sound, North Carolina.*—Light and fog signal discontinued, owing to the close of navigation by ice February 14; reestablished February 23, 1895.
- Old Plantation Flats light-station, Chesapeake Bay, Virginia.*—Structure canted up by ice and light and fog signal discontinued February 18; reestablished March 4, 1895.
- Ice House post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and reestablished April 3, 1895.

*Long Reach (upper) post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 2; rebuilt and light reestablished April 3, 1895.

*Pride Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 3; rebuilt and light reestablished April 3, 1895.

*Burnt House Pier post light, Thames River, Connecticut.*—Structure carried away by ice and light extinguished March 8; rebuilt and light reestablished April 3, 1895.

*Execution Rocks light-station, westerly end of Long Island Sound, New York.*—Fog signal disabled and discontinued from March 9 to March 28, 1895.

*Nine-Mile Point post light, St. Johns River, Florida.*—Structure destroyed by fire and light shown from temporary stake March 25; structure rebuilt and light reestablished as before April 22, 1895.

*Hell Gate post light, East River, New York.*—Characteristic changed to fixed red above fixed white March 30; former characteristic restored April 18, 1895.

*Mouse Island (lower) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.

*Mouse Island (upper) post light, Connecticut River, Connecticut.*—Discontinued from April 2 to May 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—A gas-lighted buoy was established on either side of the mouth of the dredged channel April 4. West side buoy moved about 2 miles to southward and placed on east side of channel and east side buoy moved about 1 mile to southward May 15, 1895.

*Bath Dike post light, Hudson River, New York.*—Structure carried away by a freshet and light extinguished April 9; structure rebuilt and light reestablished April 11, 1895.

*Pleasure Island post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.

*Covells Folly post light, Hudson River, New York.*—Structure submerged by a freshet and light extinguished April 9; light reestablished April 28, 1895.

*Green Flats post light, Hudson River, New York.*—Structure destroyed by freshet and light extinguished April 9; rebuilt and light reestablished May 1, 1895.

*Colt Pier range (front) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.

*Colt Pier range (rear) post light, Connecticut River, Connecticut.*—Discontinued from April 10 to May 4, 1895, owing to the heavy freshets.

*Sand Spit beacon light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 29, 1895.

*Roha Hook post light, Hudson River, New York.*—Structure carried away by freshet and light extinguished April 10; rebuilt and light reestablished April 27, 1895.

*Nashua post light, St. Johns River, Florida.*—Structure knocked down by a tow and light extinguished April 10; light on temporary stake April 11; structure rebuilt and light reestablished as before April 21, 1895.

*East Haddam Meadows post light, Connecticut River, Connecticut.*—Discontinued from April 15 to April 20, 1895, owing to heavy freshets.

*Mobile Bay Dredged Channel, Mobile Bay, Alabama.*—Twenty-six lights established April 15 to remain one calendar month. Lights reestablished May 15, 1895, to remain until permanent system is established. Two additional temporary lights established May 16.

*Dog River Bar beacon light No. 1, Mobile Bay, Alabama.*—Changed from fixed red to fixed white April 15, 1895, to remain so during the existence of the temporary system of lighting Mobile Bay Dredged Channel.

*Choctaw Pass Channel range (rear) beacon No. 3, Mobile Bay, Alabama.*—Discontinued from April 15 to May 4, 1895.

*Press Barn Bar range (front) post light, Connecticut River Connecticut.*—Discontinued from April 17 to May 20, 1895, on account of the heavy freshets.

*Gedney and Bayside Range Cut Channels, entrance to New York Lower Bay, New York and New Jersey.*—An experimental system of ten electrically lighted spar buoys was established and operated during daylight from May 2 to July 1, 1895. At night the buoys were lighted with oil lanterns.

*Delaware Breakwater (east end) light-station, entrance to Delaware Bay, Delaware.*—The fog signal at this station was disabled from May 5 to May 9, 1895.

*South Pass light-vessel, No. 43, off South Pass entrance to the Mississippi River, Louisiana.*—Withdrawn from her station for the summer months May 18, 1895.

*Wreck of the Kate Kelly light, Lake Michigan, Michigan.*—A white lantern light established June 15, 1895. (Discontinued October 11, 1895.)

*Martins Industry light-vessel, No. 1, off Port Royal entrance, South Carolina.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 29, sounding a bell struck by hand instead of a steam fog signal, June 20, 1895. (Relief light-vessel No. 29 withdrawn and light-vessel No. 1 replaced August 20, 1895.)

*Beacon light, No. 9, North River, North Carolina.*—Structure knocked down by a passing vessel and light extinguished June 21, 1895. (Rebuilt and light reestablished September 27, 1895.)

*Marblehead light-station, entrance to Marblehead Harbor, Massachusetts.*—Light moved to a temporary tower June 22, 1895, to make place for the erection of a new tower.

*Sandy Hook light-vessel, No. 51, off the entrance to New York Lower Bay, New York.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 16, showing a fixed white reflector light instead of an occulting electric light, June 24, 1895. (Relief light-vessel withdrawn and light-vessel No. 51 replaced July 3, 1895.)

*Brant Point light, entrance to Nantucket Harbor, Massachusetts.*—Changed from a fourth-order to a lens-lantern light on the nights of June 24 and 25, 1895.

Aids to navigation maintained by the Light-House Board, June 30, 1895.

Aids.	First district.	Second district.	Third district.	Fourth district.	Fifth district.	Sixth district.	Seventh district.	Eighth district.	Ninth district.	Tenth district.	Eleventh district.	Twelfth district.	Thirteenth district.	Fourteenth district.	Fifteenth district.	Sixteenth district.	Atlantic coast.	Pacific coast.	Lake coast.	Western rivers.	Total entire coast, 1894.	Total entire coast, 1895.	Increase or decrease.
Electric lights.....	2	1	1	5	6	7	8	2	3	1	2	9	9	9	9	9	2	18	3	.....	2	2	.....
First-order lights.....	2	4	6	5	5	7	8	1	1	1	2	1	1	1	1	1	40	1	3	.....	56	56	.....
Second-order lights.....	7	3	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	1	.....	.....	19	19	.....
Third-order lights.....	6	1	5	3	.....	4	5	8	3	6	8	3	1	1	1	1	27	4	22	.....	52	53	.....
Three-and-a-half order lights.....	.....	2	.....	.....	.....	.....	1	3	.....	.....	4	.....	.....	.....	.....	.....	3	.....	7	.....	10	10	.....
Fourth-order lights.....	19	23	38	13	41	7	6	13	32	23	32	10	7	7	7	7	157	17	90	.....	266	264	.....
Fifth-order lights.....	24	16	20	7	22	4	1	14	14	6	14	5	2	2	2	2	105	7	37	.....	148	149	.....
Sixth-order lights.....	1	5	31	3	11	6	1	2	18	16	12	.....	.....	.....	.....	.....	51	7	55	.....	111	108	.....
Light lenses.....	2	3	6	3	19	7	7	1	4	14	44	4	12	12	12	12	47	16	63	.....	114	126	.....
Range lenses.....	.....	.....	6	8	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	16	16	.....
Reflectors.....	.....	10	.....	8	4	14	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	38	.....	4	.....	45	42	.....
Tubular and other lanterns.....	8	6	127	7	9	155	15	59	16	3	49	7	83	538	524	850	353	90	91	1,411	1,895	1,950	.....
Light vessels in position.....	10	10	7	4	3	3	.....	.....	2	4	3	.....	1	.....	.....	.....	29	1	11	.....	49	41	.....
Electric buoys.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	7	11	.....
Gas buoys.....	.....	4	3	2	1	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	.....	.....	9	12	.....
Total lighted aids.....	64	88	262	63	118	208	44	103	100	76	168	39	115	528	524	359	911	154	383	1,411	2,780	2,859	79
Fog signals operated by steam or hot air.....	13	10	16	6	6	4	.....	.....	23	6	24	15	10	.....	.....	.....	52	25	53	.....	125	130	5
Fog signals operated by clockwork.....	17	10	50	7	63	3	.....	11	7	3	7	7	3	.....	.....	.....	180	10	15	.....	186	185	.....
Day beacons.....	103	73	40	5	10	50	36	13	.....	.....	1	49	43	2	.....	.....	330	91	1	2	412	424	12
Warning buoys.....	11	12	5	4	6	6	3	4	.....	.....	.....	12	8	.....	.....	.....	66	20	.....	.....	66	66	.....
Ball buoys.....	18	15	22	6	1	15	5	.....	.....	.....	.....	6	4	.....	.....	.....	84	10	2	.....	92	98	6
Other buoys.....	635	510	576	187	1,079	268	266	101	93	146	322	73	271	.....	.....	.....	3,642	344	561	.....	4,438	4,547	109
Total unlighted aids.....	797	630	709	215	1,158	374	300	132	123	155	353	162	338	2	.....	.....	4,314	500	632	2	5,319	5,448	129
Total number of aids.....	861	718	971	278	1,276	582	344	235	223	231	521	201	453	530	524	359	5,225	654	1,015	1,413	8,099	8,307	208

*Appropriations made at the third session of the Fifty-third Congress for light-house purposes.*

Supplies of light-houses .....	\$385, 000
Repairs of light-houses .....	490, 000
Salaries of light-keepers .....	680, 000
Expenses of light-vessels .....	285, 000
Expenses of buoyage .....	415, 000
Expenses of fog signals .....	70, 000
Inspecting lights .....	3, 000
Lighting rivers .....	300, 000
Survey of light-house sites .....	1, 000

**SPECIAL WORKS.**

Boston light-vessel, additional .....	35, 000
Butler Flat, Massachusetts .....	45, 000
Chequamegon Point light and fog-signal station, Wisconsin .....	10, 000
Detroit River lights, Michigan, north and south ends of Grass Island .....	6, 700
Devils Island light and fog-signal station, Wisconsin .....	22, 000
Eagle Harbor fog signal, Michigan .....	5, 000
Grand Marais light-station, Michigan (making available) .....	4, 000
Grand Marais Harbor of Refuge, light and bell, Michigan .....	15, 000
Grays Harbor light and fog-signal station, Washington .....	39, 500
Kennebec River lights, Maine .....	17, 000
Lower Cedar Point light-station, Potomac River, Maryland (with power to contract up to \$75,000) .....	25, 000
Manitowoc fog signal, Wisconsin .....	5, 500
Maumee range light-station .....	20, 000
Mendota light-station, Michigan .....	7, 500
Mobile Ship Channel lights, Alabama .....	30, 000
North Head light-station, Washington .....	25, 000
North Manitou light and fog signal, Michigan .....	20, 000
Oil houses for light-stations .....	5, 000
Plum Beach light and fog-signal station, Rhode Island (with power to contract up to \$60,000) .....	20, 000
Portage Lake Ship Canal Pierhead fog signal, Michigan .....	5, 500
Porte des Morts range lights and fog-signal station, Michigan .....	21, 000
Sheboygan fog signal, Wisconsin .....	5, 500
Smith Point light-house, Chesapeake Bay, Maryland (with power to contract up to \$80,000) .....	25, 000
South Fox Island fog signal, Michigan .....	5, 500
Southwest Ledge fog signal, Connecticut .....	3, 000
Spectacle Island range lights, Massachusetts .....	9, 350
Spring Point Ledge light and fog signal, Maine (with power to contract up to \$45,000) .....	20, 000
Squaw Point light, Michigan .....	5, 000
Staten Island light-house depot sea wall .....	25, 000
Sturgeon Bay Canal light-station, Wisconsin .....	20, 000
Tibbetts Point fog signal, New York .....	4, 300
Umatilla Reef light-vessel, Washington (with power to contract up to \$80,000) .....	40, 000

**NEW WORKS AUTHORIZED.**

Congress authorized, by act approved on February 15, 1893, the establishment of a number of light-stations at an aggregated cost of nearly half a million dollars, but made no appropriation at that time for their

construction. Since then, from time to time, appropriation has been made for the erection of many of them. The following is a list of the light-stations remaining for which no appropriation has yet been made, with the maximum amount which each may cost:

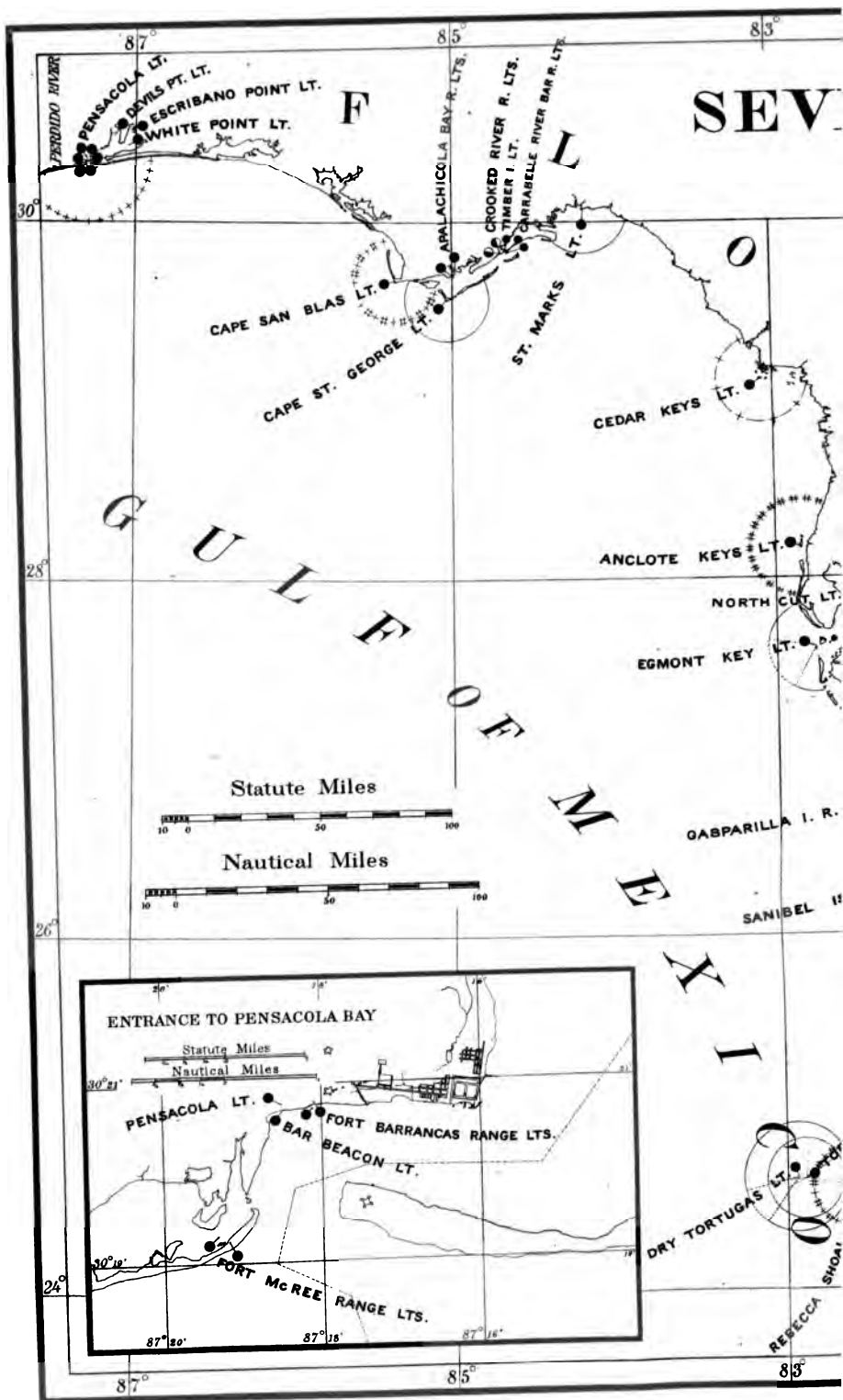
Galloo Island fog signal, New York.....	\$5, 700
Carlton Island light-house, New York.....	8, 600
Bay State Shoal lights, New York.....	800
Erie Harbor (Presqu'ile) fog signal, Pennsylvania.....	4, 300
Fairport Harbor fog signal, Ohio.....	4, 300
Lorain Harbor (Black River) fog signal, Ohio.....	4, 300
Port Clinton light, Ohio, reestablishing.....	1, 500
Poe Reef light-vessel, Straits of Mackinac, Michigan.....	25, 000
Big Sable Point fog signal, Michigan.....	5, 500
Sand Hills light-house, Michigan.....	20, 000
Bayfield light and fog signal, Wisconsin.....	5, 000
Pats (or Hat) Point light and fog signal, Minnesota.....	15, 000
Ludington light and fog-signal station, Michigan, keeper's dwelling.....	4, 500
St. Joseph fog signal, Michigan.....	5, 000
St. Martin Island light, Michigan.....	15, 000
Little Gull Island light and fog signal, Michigan.....	20, 000
Peshtigo Shoal, Green Bay, Wisconsin.....	10, 000
Wilson Harbor light, New York.....	2, 500
Big Oyster Bed Shoal light and fog signal, New Jersey.....	25, 000
Deer Point light, Florida.....	1, 000
New York Slough light and fog signal, California.....	10, 000
Mermentau River light, Louisiana.....	7, 000
Willamette River, Oregon, 25 beacon lights and buoys between Salem and Portland.....	5, 000

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report, under specified headings, from which it will be evident that the Board has brought the numerous and varied aids to navigation under its charge up to the proper standard, and that it has done all that was possible, with the funds provided, to meet the requirements of commerce and navigation.

#### SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1895 was \$385,000. While the appropriation was the same as that of the previous year, the number of light-stations was increased, and it is reasonable to expect that appropriations will be made during the present session of Congress for still other light-stations.

The Board has found it impossible, with funds provided, to keep up its reserve stock of supplies with which to meet emergencies. This stock has been heavily drawn upon. The meagerness of preceding appropriations has made it necessary for the Board to cut down the quantity of supplies furnished yearly to the light-houses to such an extent that it can go no further without danger to the lights. In spite of the severe economy used, there is danger that the present lights and those which are being built can not be properly kept up without an





transportation to fix it, and the life of the machine is much shorter than it would be if in the charge of a certificated engineer. It is poor economy to stint the pay of engineers to such point that the services of only the poorest can be commanded, as it costs so much to remedy the mistakes they unavoidably make.

It has been found in practice that it is difficult to retain in the service men of sufficient experience and ability to operate and take the proper care of the delicate, complicated, and expensive illuminating apparatus placed in their charge. Hence it costs more than it formerly did, and more than it ought, to keep this apparatus in running order. The Board therefore suggests that it would be better, from an economical point of view, to raise the average salary of the light-keeper to the amount fixed by law rather than to maintain it at its present rate, and especially to decrease it still more.

The Board anxiously feels the difficulty with which it retains its trained and experienced light-keepers. The pay they receive is insufficient to induce them to remain in the service. During the four years between March 4, 1885, and March 4, 1889, 769 persons entered the service by original appointment. During the four years which elapsed between March 4, 1889, and March 4, 1893, 672 persons received original appointments into the Light-House Service. Each of these appointments was made to fill a vacancy made by cause. These causes were death, resignation, or removal. Each removal was made for specified written and recorded cause, and never for political reasons. The removals number, say, one in seven of all the vacancies. The vacancies caused by death are inconsiderable in number. The vacancies caused by resignation are, say, between five and six out of every seven.

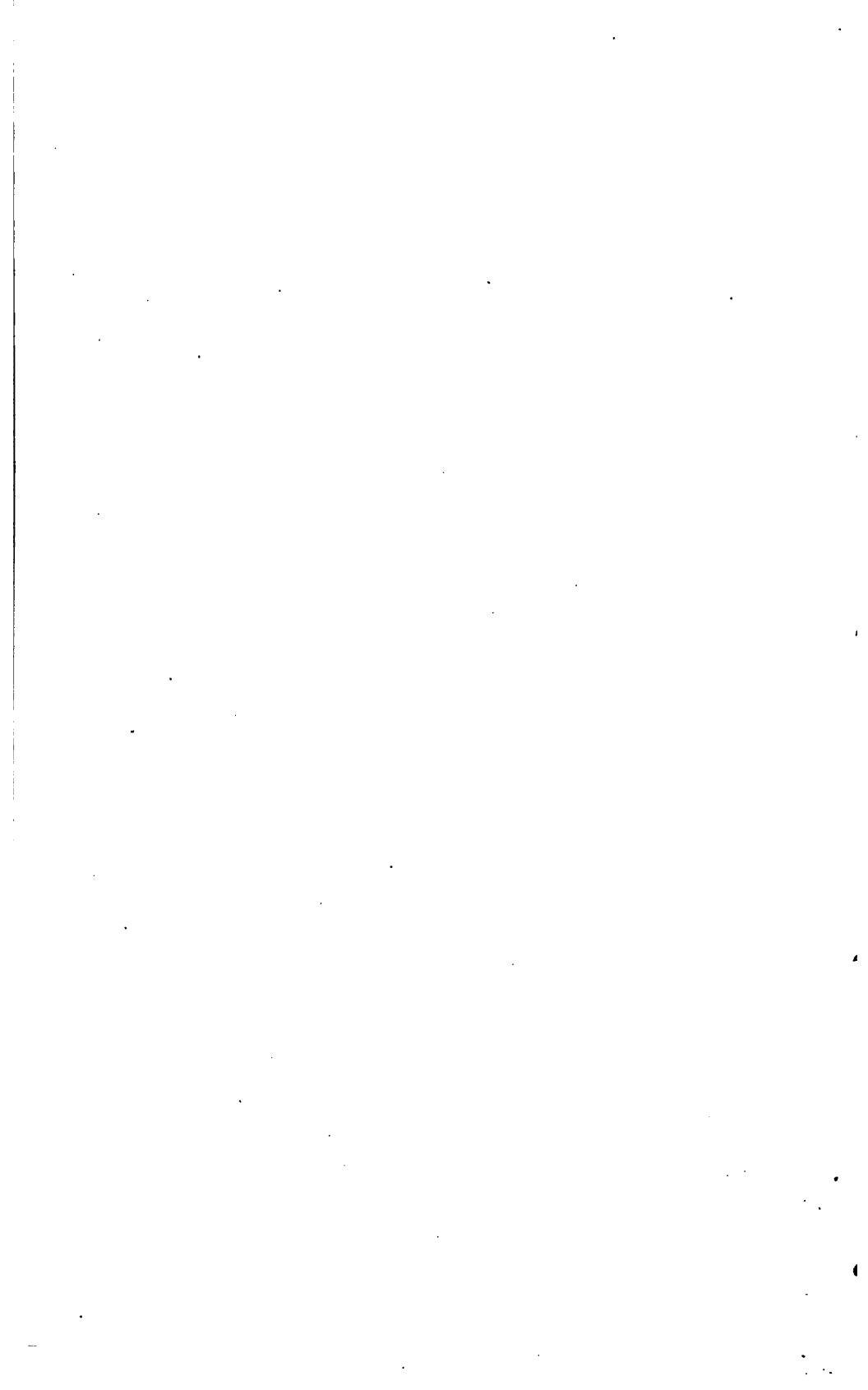
Some of the light-stations are undermanned. At others, the more isolated, it is difficult to retain good men at the rates paid. The appropriations made do not permit the Board to pay the average rates allowed by law. But even on the present basis it is estimated that \$700,000 will be needed for salaries of light-keepers during the next fiscal year.

#### EXPENSES OF LIGHT-VESSELS.

Congress appropriated \$285,000 to defray the expenses of light-vessels during this fiscal year. The appropriation has been expended and many needed repairs go over to next year. The cost of the maintenance of the light-vessel which was established off Boston Bay, Massachusetts, in October, 1894, is to be defrayed by the appropriation for the coming year. The wear and tear on the older light-vessels was greater than usual, owing to their increased age. The Board estimates, therefore, that the expenses of light-vessels for the ensuing fiscal year will be \$350,000, and it is recommended that an appropriation of that amount be made therefor. Within the past two years the number of light-ships established has been increased by 33 per cent, but there has been no corresponding increase in appropriations necessary to meet the increased cost of maintenance.

#### EXPENSES OF BUOYAGE.

Congress at its last session appropriated \$415,000 for the expenses of buoyage during the current fiscal year. There are now some 4,725 buoys of all kinds in position. The buoys which were carried away or sunk at their moorings during the past year were replaced from the stock



## NEW LIGHT-STATIONS AND DEPOTS.

The estimates for special appropriations for new light-stations and depots have been revised with particular care to bring them up to date and to make them conform to the actual needs of navigation in the various districts throughout the coast and inland waters. Several estimates formerly submitted for special appropriations to rebuild or renew existing structures have been omitted, as such work can be done more advantageously under the general appropriation for repairs, provided the latter be made sufficient, and the special estimates are thereby reduced to a minimum.

## NEW LIGHT-VESSELS.

The Board has recommended in the proper places in the body of this report that appropriations be made for building six new light-vessels. Each is much needed, but attention is especially invited to the urgent necessity for a relief light-vessel in the Fourth light-house district.

## NEW TENDERS.

Recommendation is repeated in certain of the following pages that appropriations be made for the construction of three steamers to be used as light-house tenders in the Second, Third, and Seventh light-house districts to replace old steamers now so nearly worn out that they can only last, if used with care, until new vessels can be built to take their places.

## OIL HOUSES.

The Board again recommends that appropriation be made for the erection of small, inexpensive structures near to, but separate from, light-houses, in which to keep a year's supply of mineral oil, the illuminant now used by the Light-House Establishment. Last year the Board estimated that \$15,000 could be expended with great advantage during the year among the larger, more isolated, and more important light-stations. An appropriation of \$5,000 was made for that purpose, which will be expended during the current year.

It is estimated that \$10,000 will be needed and can be profitably expended in building oil houses during the coming fiscal year, and the appropriation of that amount is therefore recommended.

The recommendation made in the annual report for each of the last nine years was accompanied by the following explanation:

The substitution of mineral oil for lard oil in the light-house service, which has been in progress several years, is now finished. As the quantity of the oil now used is larger, and as its bulk is greater than was that of the oil formerly used, and as the mineral oil is much more likely to occasion fire, and indeed to take fire, than was the lard oil, the Board has come to the conclusion, in the interest of safety, to advise that the proper steps be taken to have a house erected at each of the larger stations, from a plan specially devised after a careful study, for the purpose.

### Seventh District.

777. *Gasparilla Island, entrance to Charlotte Harbor, Florida.*—A second-order oil house was completed February 15, 1895, under contract. Minor repairs were made.

782. *Egmont Key, entrance to Tampa Bay, Florida.*—A second-order oil house was completed January 24, 1895, under contract. Various repairs were made.

The following recommendation, which was made in the Board's last two annual reports, is renewed:

A new dwelling is needed for the assistant light-keeper. The Board estimates that it can be built for not exceeding \$4,000, and it is recommended that an appropriation of this amount be made for that purpose.

The Board is now of the opinion that this keeper's dwelling can be erected for, say, \$3,500, and it recommends that an appropriation of this amount be made therefor.

— *Tampa Bay beacons, Florida.*—There are eleven of these beacons, seven lighted and four day beacons. They were completed in December, 1894, and mark the channels in Tampa and Hillsboro bays, Florida. The lighted beacons are of triangular iron framework resting on sleeve piles, and have Funck-Heap lamps. The beacons are designated by name as follows:

North Channel day beacon.  
Southwest Channel day beacon.  
Mullet Key Shoal beacon.  
Indian Hill beacon.  
Wreck of Steamer Cool day beacon.  
South Cut beacon.

North Cut beacon.  
Catfish Point Shoal day beacon.  
Long Shoal beacon.  
Middle Ground beacon.  
Barrel Stake beacon.

Lights were first established on these beacons on January 25, 1895.

— *Tampa Bay and Manatee River beacons, Florida.*—Contracts for the erection of these beacons were made. There will be five of them. Each will be built upon a cluster of four piles with a platform and a Funck-Heap lamp.

792. *St. Marks, St. Marks River, Florida.*—A new cistern was put up. Extensive repairs were made.

793. *Crooked River, Florida.*—The erection of this station was begun in January, 1895, under contract. The material has all been delivered, and on June 30, 1895, the buildings were nearly completed.

— *Carrabelle beacons, St. George Sound, Gulf of Mexico, Florida.*—These beacons are called Front Range, Rear Range, and Timber Island. They were completed in March, 1895, and lighted in the following June. They are intended as guides in crossing the bar of Carrabelle River. Beacon No. 3, or the upper one, marks the turning point in the river by which the shoals in the harbor of Carrabelle are avoided. They are each built on a cluster of six piles, with a platform and Funck-Heap lamp.

794. *Cape St. George, near St. George Sound, Florida.*—A first-order oil house was completed in December, 1894, under contract.

weed moving on the bottom in the rapid tidal currents of Vineyard Sound repeatedly broke the slender cable employed, necessitating frequent underrunning and relaying, and no attempt was made to continue the communication after the inspection.

The following winter the Popes Island Manufacturing Corporation, of New Bedford, Mass., made for the writer a 5-fathom chain of one-half inch Howard metal, which is noncorrodible in sea water and whose electrical conductivity is about that of brass. This experimental chain, when submerged, conducted, so far as practical results are concerned, apparently as well as a continuous insulated cable. Unfortunately, to the present time no successful method is known of welding this metal into links sufficiently heavy for anchor purposes. Its tensile strength, as shown from tests at Watertown arsenal, is reported to be about 90,000 pounds to the square inch, and this property, coupled with its noncorrodibility, would make it of special value for light-vessel anchor chains, independently of its service in electrical communication. From the experiments of 1893 there is encouragement to believe that through the ship's anchor chain, and quite surely so if it be of noncorrosive metal, such as the Howard, telephone connection can be established by the above method, and such method would be the simplest possible for light-ships.

In the following summer (1894) experiments were made upon another method of telephoning to light-ships, and in the course of these, incidentally, an observation was made upon the above-described chain method. A submarine cable 5 miles long, which was in use for experiment, became fouled with the Scotland light-ship anchor chains. Its copper core came into metallic contact with the chain about 60 fathoms from the ship. A receiving telephone, which was connected with the hawse pipe of the ship and thereby directly with the anchor chain, became so loud as to be heard everywhere in the ship's cabin and indicated direct metallic connection through to the shore. To determine if this was the case, an insulated wire was then connected directly with the core of the cable and brought on board, and matters so arranged that the telephone could be alternately cut into the cable circuit either through the insulated wire or through the hawse pipe connection and anchor chain. No decisive difference in the loudness of the telephone could be detected. It seemed right to conclude, therefore, that the current passed through a portion of the anchor chain. Other experiments under way have precluded, to this time, further tests upon this chain method. Sufficient has been done, however, to encourage the belief that the anchor chain may be successfully used to complete electrically the cable circuit.

The second method, which has been alluded to as being experimented upon in 1894, will be designated the diffusion method. It, like the chain method, was devised by us to avoid bringing the end of a submarine cable from the sea bottom up on board ship. The anchor chain was not made part of the telephone circuit in this method, but the entire region of water in which the ship could swing was electrified in such a way by the telephone current as to present differences of potential at different points in its area sufficient for telephonic purposes. By order of your Board the experimental plant which was to test the method was located off Sandy Hook, N. J., a place convenient to the shops of the Department at Tompkinsville, and in ordinary weather easily accessible to the light-house tenders. The Scotland light-vessel was selected with which to establish communication. This was  $4\frac{1}{2}$  miles offshore, in 10 $\frac{1}{2}$  fathoms mean low water. It was not the intention to establish permanent communication with this vessel, as communication at this point would not be of particular service to the Department.

The method in general was carried out in the following manner: An iron-armored submarine cable was laid from Sandy Hook, at the power station of the Gedney Channel Electric Buoy System, out to the Scotland light-ship, 5 statute miles, of which one-half mile was underground across the Hook. This cable terminated in a junction box on the sea bottom, about 900 feet from the mushroom mooring anchor of the light-ship. The location of the light-ship and the course of the cable are shown in the accompanying map, Pl. I. The cable was a portion of that used at the World's

Columbian Exhibition in Chicago to light the electric buoys along the lake front. It is described in detail in "Report on electric buoys," by Lieut. Commander C. H. West, U. S. N., Report of the Light-House Board, 1893. The cable was made by the Bishop Gutta-Percha Company, New York, and consisted of a single core of seven No. 16 B. & S. copper wires, three-sixteenths inch thick pure gutta-percha insulation, one-fourth inch thick layer of tarred jute, and an armor of sixteen No. 5 iron wires.

Through the courtesy of the Western Union Telegraph Company, the twin-screw cable steamer *Western Union* laid the cable on September 30, 1894. The illustration, Pl. II, shows the manner of taking the cable on steam reel aboard the *Western Union* preparatory to laying it; all other cable laying and handling was done by the tender *Gardenia*, under the skillful direction of Capt. C. A. Ruland. The half mile under-ground portion was connected with the submarine portion through a junction box buried in the sand at the shore end. This enabled the cable to be tested in either direction whenever necessary. From the submerged junction box a short length of cable was laid to another larger junction box containing a step-down transformer, so constructed as to be unaffected by submersion. The core of the cable was grounded upon the armor of the cable through the higher resistance coil of this transformer. This latter was proportioned electrically for the particular circuits connected to it, and operated with closed magnetic circuit. Details of design and construction are not here given in this general report. The two terminals of the lower resistance coil were grounded through a grid laid upon the sea bottom. This grid consisted of three insulated copper wires, each of 27 No. 10 wires (equivalent to No. 3/0 B. & S.), each 1,200 feet long and laid parallel about 300 feet apart. At one end the three were connected together and to one terminal of the lower resistance coil of the transformer. Each of the other three ends were grounded on a netting of 500 square feet of 3-inch mesh No. 12 copper wire. The other terminal of the transformer was grounded on 1,500 square feet of similar copper netting. These grounds were rolled up and handled with ease by the sailors while laying them from small boats. The center of the grid was approximately the ship's moorings. It is evident that the grid constructed thus was of exceedingly low resistance.

A current entering the grid could diffuse itself into the water from and between the wire nettings and establish a diffusion area around the light-ship. Experiments showed that, generally speaking, any two points on the water's surface, over this area, a hundred feet or so apart, would be at different electrical potentials and sufficient for practical telephonic purposes. The diffusion lines, whether due to leakage or induction, were sufficiently well distributed to produce operation of the telephone in any position of the ship, although differences in intensity were observed. Through the kindness of Hammond V. Hayes, Ph. D., chief electrician, American Bell Telephone Company, powerful low-resistance carbon transmitters were obtained, and measurements were made in the laboratory at the light-house station at Tompkinsville to determine the best conditions of action of these. Results beyond the requirements of the circuits to be employed are not recorded here. Several ampere-meters, including a Whitney reading to 5 amperes in twentieths, were all found to be wholly unreliable, as their impedance for rapid alterations was too great for low-resistance circuits. In fact, it was found that no form of coil amperemeter could be used. A hot-wire amperemeter was then devised and constructed. The accompanying cut, Pl. III, is a photograph of the same. It was calibrated with a Standard Weston Amperemeter. It was found that the greatest amount of energy obtainable by shouting or singing into the transmitter was about 1.5 to 2 watts, and the average strength of current through the carbon contacts about 2.2 amperes. The maximum energy that could be delivered to the submerged transformer over the line by these transmitters did not exceed 1 watt. The capacity of the transformers was about 100 times this. When used with the cable a suitable induction coil was interposed between the transmitter contacts and the cable.

However, with this small amount of energy available at the transformer (less than one seven-hundredth of a horsepower) there was found with the light-house tender *Gardenia*, which was suitably equipped with transmitting and receiving circuits, over 16 acres of water around the light-ship throughout which telephonic conversation could be carried on with Sandy Hook station and while under full steam. As the *Gardenia* has a wooden hull without sheathing, two plates of sheathing metal 7 by 3 feet were attached to bow and stern and wires run from them to the pilot house, as shown in the cut annexed, Pls. IV and V. The plates were about 113 feet apart, and sufficient potential difference existed over the 16 acres to operate well. Indeed, we were able from the *Gardenia* to talk with the light-ship or with the Sandy Hook station or to hear the conversation between the Hook and the light-ship while we were steaming about. The circuit upon the light-ship was made as follows: The two hawse pipes were connected together in the hold by a copper bar  $2\frac{1}{2}$  by  $\frac{1}{2}$  inches cross section, and extra plates put between the metallic sheathing of the ship and the hawse pipes outside to assure good connection through to the water. The circuit was then continued from the copper bar to the after cabin through a stranded insulated cable equivalent to No. 3/0 wire. Here it was connected with a telephone cupboard, which was bolted to the bulkhead in the cabin, and convenient supports against the rolling of the ship provided for the person using it. A similar cupboard was used at the shore end.

When the telephone was not in use the calling device was alone in circuit. The opening of the cupboard door cut out this device automatically and cut in the receiver. The receivers were of the watch form, made by the National Telephone Company of Boston, but were rewound by us to the best resistance, which was determined by an extended series of experiments both for the ship and the shore instruments. The ship's receivers were arranged in the form as shown in Pl. VII, which left the hands free for support against the ship's motions. A favorite shore form is also shown, Pl. VII, which combined transmitter and one receiver on one support. The transmitters were cut in only in sending. Both transmitters and receivers were used with induction coils. Much experimenting, both in the laboratory and on each end of the line, was done to determine not only the advantages of induction coils, but also the proper design and construction of the coils. A detailed account of the methods and apparatus used would be too extended for this report. Suffice it to say, open-circuit coils were selected; step up at the shore end, 900 turns No. 16 wire in the secondary; on the ship, step down, 40 turns No. 7 on the secondary.

From the cupboard in the cabin the stranded cable was continued to the after deck, thence along the underside of the main boom through a block at its end, and there dropped down to a submerged ground. This ground was devised to meet both the electrical and nautical requirements. Four 30-foot lengths of 3-inch manila rope were taken, and a strip 2 inches wide of sheathing metal wound spirally around each, with a quarter inch space between each turn. At each foot the metal was riveted through the rope. The four ropes were then connected in parallel at one end. Each rope became then a flexible conductor trailing from the boom end. The pulley block allowed them to be raised or lowered, as need be, and the slack was neatly coiled out of the way in cleats on the side of the after hatch. This tail piece has been in use now ten months, in all sorts of weather, never fouling, handled by the sailors, and coiled on the deck like any ordinary rope when not in use. This tail piece would generally tend the tide quite freely. The extreme distance between bow sheathing and the tail rope was about 120 feet. Experiment, however, showed that sufficient difference of electrical potential existed also between the bow and rudder sheathing, and even between the bow and stern sheathing, to operate the receiver, although of course not as well as between bow and tail ropes.

The laying of the grid in the winter season was a difficult task, but was successfully accomplished by the skill and excellent judgment of Capt. C. A. Ruland, of the steamer *Gardenia*, and now of the *John Rodgers*. Experimenting was begun in August,

**Seventh District.**

some 9,610 nautical miles and consumed for all purposes about 606 tons of bituminous coal. The hull of the vessel shows signs of weakness working in a seaway and makes more water at that time than when at rest in smooth water. An entire new set of riding bitts of yellow pine were made and put in by the depot force. The fender guards on the starboard side were renewed, as were several of the stanchions of the forward bulwarks, and the rail was refastened. The mainmast, from the spider band to the hurricane deck, has several large spots of dry rot. The vessel has not been out of water for nearly three years. The condition of the under-water portion of the hull can only be conjectured until the vessel is docked and examined. As far as can be seen there is some metal off and loose in the wake of the gangways for working buoys.

There is considerable lost motion in the rudder, and when the vessel is docked it will be unshipped and examined. The first whaleboat and dingey are in good condition. The second whaleboat, an old boat transferred from the tender *Putnam* before her sale, has been kept in service only by continued patching. She is beyond further repair and should be condemned and replaced by a new boat. The sails, awning, etc., are in good condition and will outlast the vessel. The engines are in fair condition, but need a thorough and general overhauling. The holding-down bolts are slack and can not be set up any farther without danger of their carrying away. A new tender with greater capacity for carrying buoys, with more deck room, and with more speed than the *Laurel* is urgently required to meet the increasing work of this district. The new lights that have been established during the past fiscal year will increase the mileage to be steamed per annum for inspections some 300 miles.

The following recommendation, which was made in effect in the Board's last annual report, is renewed:

*New tender.*—The *Laurel* is so old and so frail that it is quite evident that she has nearly survived her usefulness. If she can be kept in commission until a new tender is built and ready for service it will be as much as can reasonably be expected. It is estimated that a tender can be built specially fitted for service in the Gulf of Mexico and its tributaries for not exceeding \$75,000, and it is recommended that an appropriation of this amount be made therefor.



"It was certain also that with the most efficient relay we could hope to obtain it would be necessary to employ a calling current of considerable power.

"The fact that a submerged transformer was included between the main cable of the system and the grid made it necessary to use alternate currents, and the safe capacity of this transformer being only about 75 to 100 watts at 125 cycles per second limited the 'shore to ship' calling current to that amount, unless a larger transformer was substituted. For many reasons such a change was not then advisable. The fact that the main cable had only one conductor made it necessary to use the same submerged transformer for both talking and calling.

"It is well known that transformers are generally most efficient at full load and very inefficient when the load is small. Hence a large transformer adapted for strong calling currents would probably be very inefficient for the weaker talking currents, and might seriously impair the talking efficiency of the system.

"These difficulties were anticipated to some extent in the first transformer, which was especially designed to work efficiently at small loads and was made as large as then seemed consistent with good results in the telephone.

"Now, when it is considered that the safe 'shore to ship' calling current was limited by the submerged transformer to about 100 watts; that sufficient funds were not available to equip the ship for 'ship to shore' work, and thus avoid the transformer difficulties; that the efficiency of the system was as low as 0.00004 per cent; that the relay which was to close the bell circuit must be operated by an almost infinitesimal current, and finally that this delicate relay must not be affected by the violent motion of the light-ship, it will be seen that there was a rare combination of serious obstacles to be overcome in perfecting the calling system.

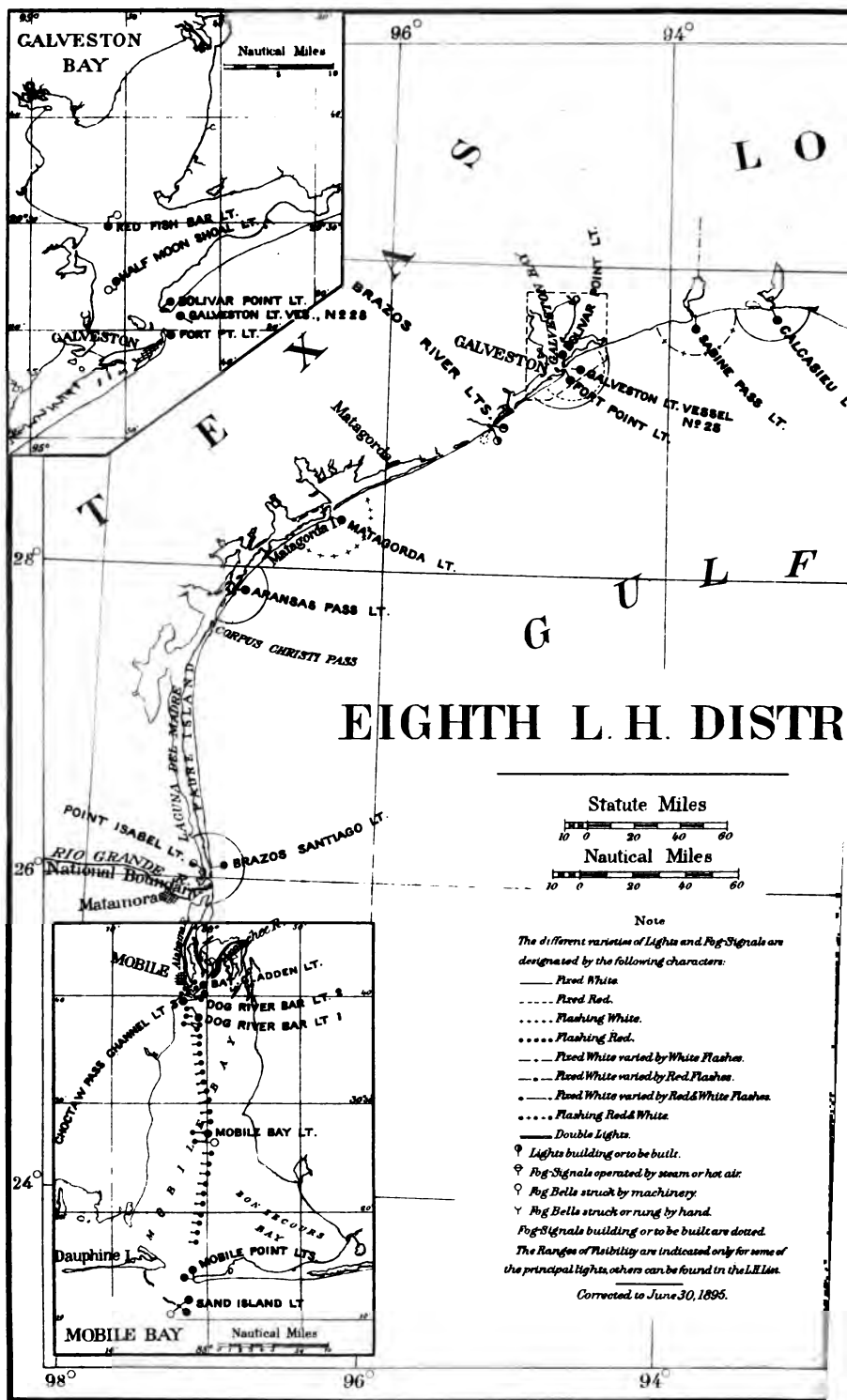
"Two general methods for solving this problem suggested themselves. In the first method, which for convenience may be called the synchronous method, a sending device would be provided capable of producing in the line alternating currents of a constant frequency such as would be produced by an induction coil whose primary circuit is opened and closed by the vibrations of a tuning fork. The receiving apparatus or relay for this system would be vibratory in character and tuned to a frequency of vibration to correspond with the period of the calling current. In addition to this mechanical adjustment, the electrical circuits might be adapted by the use of condensers and inductances to respond more readily to alternate currents of the same period.

"The action of such a system would be cumulative, i. e., each successive impulse of current would arrive just in time to increase the vibration in the relay until sufficient amplitude would be obtained to operate a circuit-closing device.

"There is no doubt that this principle furnishes the best possible method of producing a mechanical action with a very weak alternating current and that a simple and reliable relay of this kind could be made. The greatest objection to this system is on account of the great difficulty of producing powerful alternating currents of a perfectly constant period. Tuning forks with 'make and break' attachments are unsatisfactory for many reasons, but chiefly on account of the burning of contacts when strong currents are used. To drive a dynamo at a speed sufficiently constant for this system would be impracticable. A Tesla 'oscillator' might prove satisfactory.

"It was thought best therefore to begin work with what we called the nonsynchronous method. This method consists briefly in using a powerful 'sending' current of any convenient frequency and a relay whose operation is independent of the frequency of the calling current. This method permitted the use of any of the old and tried methods of producing alternating currents for calling, and the only serious difficulty was to make a successful relay.

"With a view to carrying out this method experiments were begun at once to perfect a suitable relay, and at the same time arrangements were made to get apparatus for producing the calling current. The instruments were necessarily crude, and adapted only for the experimental part of the work because funds were not available at the time.



wire, *b*, carrying an alternating current. This one failed to be sensitive enough, probably for the same reason as the other.

"Still another similar trial relay is shown in Pls. XII and XV. Two flat coils of insulated wire are shown at *a* and *b*. The coil *a* is fixed and *b* is arranged with fiber suspension to move about a vertical axis, as shown. Connection is made with the ends of the wire of the movable coil *b* by means of two mercury cups, *CC*. A counterpoise weight is shown at *d*. Contacts for the local bell circuits are shown at *e*.

"In this relay it was hoped to improve upon the two just described by omitting the iron from the magnetic circuit and by using greater amount of copper. The instrument was used in two different ways, as follows: (1) The received calling current was made to traverse both coils, thus causing either an attraction or repulsion between them according to whether they were connected so that at any instant the current in the two coils was in the same or in opposite direction. (2) The ends of the movable coil *b* were connected together and the received calling current was sent through the fixed coil *a* alone. With this arrangement the fixed coil *b* acts like a block of metal. An alternating current in the fixed coil *a* always produces a repulsion of *b*, which is due to the reaction of the induced current in *b* upon the inducing current in *a*. A constant or unvarying current produces no effect with this arrangement.

"With either of these two methods of connection this relay proved to be much better than the ones having soft iron cores, but it was still far from being efficient enough, and its extreme susceptibility to change of level prohibited its use except possibly for the shore station.

"The mechanical difficulties of these instruments might have been overcome by improvement in the details of construction, and the efficiency would probably have been increased somewhat by using still more copper in the coils; but after having given them many careful trials and measuring the power necessary to operate them, it seemed best, to the writer, to discard the principles involved and try something else.

"It should be noted that a distinction is made here between the sensitiveness and the efficiency of an instrument. A sensitive instrument may produce a certain mechanical effect with an exceedingly small current strength in amperes, but if its resistance is high considerable energy is represented by even a very small current flowing in its coils. An efficient machine is one in which, for a given mechanical effect, the electrical energy absorbed is small. Since a given alternating current is readily converted by a transformer into one of either large or small strength in amperes, but always representing the same amount of energy, it is evident that in our relays we require a machine of great efficiency, but not necessarily of great sensitiveness.

"A careful study of all kinds of instruments in which weak alternating currents produce mechanical movement shows that by far the most efficient ones are those in which the current does not produce an alternating magnetic field as in the electro-dynamometer, but operates to increase and decrease the strength of field of a permanent magnet. The mechanical motion produced by such polarized machine is always vibratory.

"With currents of very small amount of energy the amplitude of the resulting mechanical vibration is necessarily very small, as is the case with the magneto-telephone. Practically it is found to be far too small to operate directly a circuit-closing device for an electric bell. Hence it is necessary in employing the principle in our relay to obtain from an exceedingly small vibratory movement a greatly magnified mechanical action which will serve to open or close an electrical circuit. The writer has designed and made drawings for a machine which accomplishes this result. This machine, which we called a 'ratchet relay,' is shown in Pls. XVI and XVII. The vibratory parts consist of two large magneto-telephones of special design. Attached to the center of each diaphragm by a light spring of flat steel is a light pawl.

held in reserve, and that reserve stock has not been replaced for lack of funds. The Board, therefore, will need a larger appropriation than usual, not only to meet the immediate wants of commerce, but to bring up its stock of reserve buoys to its normal condition. The Board was unable to place buoys at certain places for which request was made, not because it was unnecessary to do so, but because the appropriation therefor was insufficient. Funds are needed to maintain buoys after they are established. It is estimated that it will require \$500,000 to defray the expenses of buoyage during the coming year, and it is recommended that an appropriation of this amount be made therefor.

#### EXPENSES OF FOG SIGNALS.

The annual appropriation for this important part of the service has been \$70,000 for a number of years, notwithstanding that the number of fog signals has been constantly increasing by special appropriations made by Congress for new light and fog-signal stations, and by the establishment of fog signals at existing light-stations under the authority of law to meet the growing demands of commerce. The conditions are now such that it is impossible to maintain the service in a proper condition and to replace obsolete apparatus and make other urgently needed improvements at existing stations without increased appropriations for this purpose.

In the earlier development of sound signals for maritime purposes the United States led the world, and the majority of appliances now in general use for this purpose originated in this country and were first used by the Light-House Board. Important improvements have since been made, however, and many of them by officers in the Light-House Service of this country, which the Board has been unable to apply for lack of funds. Some of the improvements which are urgently needed and which could now be made are (1) more efficient quick-steaming boilers for stations using steam signals, to facilitate starting the signal when needed and to afford greater economy in operation; (2) compressed-air apparatus operated by oil engines for stations where the water supply is deficient; (3) improved striking apparatus to render fog bells more effective.

It is therefore again recommended that the appropriation for fog signals be made \$125,000.

#### LIGHTING OF RIVERS.

The appropriation of \$300,000 made at the last session of Congress was barely sufficient to maintain the post lights which had already been established. And it was insufficient to enable the Board to establish and maintain other lights which it is evident are much needed. It is estimated that \$350,000 will be required to defray the expenses of lighting rivers during the next fiscal year, and it is recommended that an appropriation of this amount be made therefor.

## NEW LIGHT-STATIONS AND DEPOTS.

The estimates for special appropriations for new light-stations and depots have been revised with particular care to bring them up to date and to make them conform to the actual needs of navigation in the various districts throughout the coast and inland waters. Several estimates formerly submitted for special appropriations to rebuild or renew existing structures have been omitted, as such work can be done more advantageously under the general appropriation for repairs, provided the latter be made sufficient, and the special estimates are thereby reduced to a minimum.

## NEW LIGHT-VESSELS.

The Board has recommended in the proper places in the body of this report that appropriations be made for building six new light-vessels. Each is much needed, but attention is especially invited to the urgent necessity for a relief light-vessel in the Fourth light-house district.

## NEW TENDERS.

Recommendation is repeated in certain of the following pages that appropriations be made for the construction of three steamers to be used as light-house tenders in the Second, Third, and Seventh light-house districts to replace old steamers now so nearly worn out that they can only last, if used with care, until new vessels can be built to take their places.

## OIL HOUSES.

The Board again recommends that appropriation be made for the erection of small, inexpensive structures near to, but separate from, light-houses, in which to keep a year's supply of mineral oil, the illuminant now used by the Light-House Establishment. Last year the Board estimated that \$15,000 could be expended with great advantage during the year among the larger, more isolated, and more important light-stations. An appropriation of \$5,000 was made for that purpose, which will be expended during the current year.

It is estimated that \$10,000 will be needed and can be profitably expended in building oil houses during the coming fiscal year, and the appropriation of that amount is therefore recommended.

The recommendation made in the annual report for each of the last nine years was accompanied by the following explanation:

The substitution of mineral oil for lard oil in the light-house service, which has been in progress several years, is now finished. As the quantity of the oil now used is larger, and as its bulk is greater than was that of the oil formerly used, and as the mineral oil is much more likely to occasion fire, and indeed to take fire, than was the lard oil, the Board has come to the conclusion, in the interest of safety, to advise that the proper steps be taken to have a house erected at each of the larger stations, from a plan specially devised after a careful study, for the purpose.



weed moving on the bottom in the rapid tidal currents of Vineyard Sound repeatedly broke the slender cable employed, necessitating frequent underrunning and relaying, and no attempt was made to continue the communication after the inspection.

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*Beacon light, No. 9, North River, North Carolina.*—Structure knocked down by a passing vessel and light extinguished June 21, 1895. (Rebuilt and light reestablished September 27, 1895.)

*Marblehead light-station, entrance to Marblehead Harbor, Massachusetts.*—Light moved to a temporary tower. June 22, 1895, to make place for the erection of a new tower.

*Sandy Hook light-vessel, No. 51, off the entrance to New York Lower Bay, New York.*—Withdrawn from her station for repairs and replaced by relief light-vessel No. 16, showing a fixed white reflector light instead of an occulting electric light, June 24, 1895. (Relief light-vessel withdrawn and light-vessel No. 51 replaced July 3, 1895.)

*Brant Point light, entrance to Nantucket Harbor, Massachusetts.*—Changed from a fourth-order to a lens-lantern light on the nights of June 24 and 25, 1895.



*Aids to navigation maintained by the Light-House Board, June 30, 1895.*

Aids.	First district.	Second district.	Third district.	Fourth district.	Fifth district.	Sixth district.	Seventh district.	Eighth district.	Ninth district.	Tenth district.	Eleventh district.	Twelfth district.	Thirteenth district.	Fourteenth district.	Fifteenth district.	Sixteenth district.	Atlantic coast.	Pacific coast.	Lake coast.	Western rivers.	Total entire coast, 1894.	Total entire coast, 1895.	Increase or decrease.
Electric lights.....		1	1														2	18			2	2	2
First-order lights.....	2	4	6	5	6	7	8	2				9	9				40	1			56	58	2
Second-order lights.....	7	3	1					3				1	1				15	1	3		19	19	0
Third-order lights.....	6	1	5	3		4	5	3	1	6	8	3	1				27	4	22	7	52	53	1
Three-and-a-half-order lights.....		2																			10	10	0
Fourth-order lights.....	19	23	38	13	41	7	6	13	32	23	32	10	7				157	17	90	97	266	284	2
Fifth-order lights.....	24	16	20	7	22	4	1	14	14	6	14	5	2				105	7	37	37	148	149	1
Sixth-order lights.....	1	5	31	3	11	6	1	2	18	16	12	16	12				51	7	55	55	111	106	-5
Lens lanterns.....	2	3	6	3	19	7	7	1	4	14	44	4	12				47	16	63	63	114	126	12
Range lenses.....			6	8	2												16	16	16	16	16	16	0
Reflectors.....		10		8	4	14		2		4							38		4		45	42	-3
Tubular and other lanterns.....	3	6	127	7	9	155	15	59	16	3	49	7	83	528	524	359	358	90	91	1,411	1,885	1,950	65
Light-vessels in position.....		10	7	4		3		2	4	4	3	1	1				23	1	11	11	46	41	-5
Electric buoys.....			11																		7	12	5
Gas buoys.....		4	3	2	1		2										12				9	12	3
Total lighted aids.....	64	88	262	63	118	208	44	103	100	76	168	39	115	528	524	359	911	154	383	1,411	2,780	2,859	79
Fog signals operated by steam or hot air.....	13	10	16	6	4	2		1	23	6	24	15	10				52	25	53		125	130	5
Fog signals operated by clockwork.....	17	10	50	7	63	3		11	7	3	4	7	3				160	10	15		186	185	-1
Day beacons.....	103	73	40	5	10	50	36	13		1	1	49	42	2			330	91	1	2	412	424	12
Whistling buoys.....	11	12	5	4	1	6	3	4				12	8				43	20			66	66	0
Bell buoys.....	18	15	22	6	1	15	5	2			2	6	4				84	10	2		92	96	4
Other buoys.....	635	510	576	187	1,079	298	256	101	93	146	322	73	271				3,642	344	561		4,438	4,547	109
Total unlighted aids.....	797	630	709	215	1,158	374	300	132	123	155	353	162	338	2			4,314	500	632	2	5,319	5,448	129
Total number of aids.....	861	718	971	278	1,276	582	344	235	223	231	521	201	453	530	524	359	5,225	654	1,015	1,413	8,099	8,307	208

*Appropriations made at the third session of the Fifty-third Congress for light-house purposes.*

Supplies of light-houses.....	\$385,000
Repairs of light-houses .....	490,000
Salaries of light-keepers.....	690,000
Expenses of light-vessels .....	285,000
Expenses of buoyage .....	415,000
Expenses of fog signals.....	70,000
Inspecting lights .....	3,000
Lighting rivers .....	300,000
Survey of light-house sites.....	1,000

**SPECIAL WORKS.**

Boston light-vessel, additional.....	35,000
Butler Flat, Massachusetts .....	45,000
Chequamegon Point light and fog-signal station, Wisconsin.....	10,000
Detroit River lights, Michigan, north and south ends of Grassy Island.....	6,700
Devils Island light and fog-signal station, Wisconsin.....	22,000
Eagle Harbor fog signal, Michigan .....	5,000
Grand Marais light-station, Michigan (making available).....	4,000
Grand Marais Harbor of Refuge, light and bell, Michigan.....	15,000
Grays Harbor light and fog-signal station, Washington.....	39,500
Kennebec River lights, Maine.....	17,000
Lower Cedar Point light-station, Potomac River, Maryland (with power to contract up to \$75,000).....	25,000
Manitowoc fog signal, Wisconsin.....	5,500
Maumee range light-station .....	20,000
Mendota light-station, Michigan .....	7,500
Mobile Ship Channel lights, Alabama.....	30,000
North Head light-station, Washington.....	25,000
North Manitou light and fog signal, Michigan.....	20,000
Oil houses for light-stations.....	5,000
Plum Beach light and fog-signal station, Rhode Island (with power to contract up to \$60,000).....	20,000
Portage Lake Ship Canal Pierhead fog signal, Michigan.....	5,500
Porte des Morts range lights and fog-signal station, Michigan.....	21,000
Sheboygan fog signal, Wisconsin.....	5,500
Smith Point light-house, Chesapeake Bay, Maryland (with power to contract up to \$80,000).....	25,000
South Fox Island fog signal, Michigan .....	5,500
Southwest Ledge fog signal, Connecticut.....	3,000
Spectacle Island range lights, Massachusetts.....	9,350
Spring Point Ledge light and fog signal, Maine (with power to contract up to \$45,000).....	20,000
Squaw Point light, Michigan.....	5,000
Staten Island light-house depot sea wall .....	25,000
Sturgeon Bay Canal light-station, Wisconsin.....	20,000
Tibbetts Point fog signal, New York .....	4,300
Umatilla Reef light-vessel, Washington (with power to contract up to \$80,000).....	40,000

**NEW WORKS AUTHORIZED.**

Congress authorized, by act approved on February 15, 1893, the establishment of a number of light-stations at an aggregated cost of nearly half a million dollars, but made no appropriation at that time for their

construction. Since then, from time to time, appropriation has been made for the erection of many of them. The following is a list of the light-stations remaining for which no appropriation has yet been made, with the maximum amount which each may cost:

Galloo Island fog signal, New York.....	\$5, 700
Carlton Island light-house, New York.....	8, 600
Bay State Shoal lights, New York.....	800
Erie Harbor (Presqu'île) fog signal, Pennsylvania.....	4, 300
Fairport Harbor fog signal, Ohio.....	4, 300
Lorain Harbor (Black River) fog signal, Ohio.....	4, 300
Port Clinton light, Ohio, reestablishing.....	1, 500
Poe Reef light-vessel, Straits of Mackinac, Michigan.....	25, 000
Big Sable Point fog signal, Michigan.....	5, 500
Sand Hills light-house, Michigan.....	20, 000
Bayfield light and fog signal, Wisconsin.....	5, 000
Pats (or Hat) Point light and fog signal, Minnesota.....	15, 000
Ludington light and fog-signal station, Michigan, keeper's dwelling.....	4, 500
St. Joseph fog signal, Michigan.....	5, 000
St. Martin Island light, Michigan.....	15, 000
Little Gull Island light and fog signal, Michigan.....	20, 000
Peshtigo Shoal, Green Bay, Wisconsin.....	10, 000
Wilson Harbor light, New York.....	2, 500
Big Oyster Bed Shoal light and fog signal, New Jersey.....	25, 000
Deer Point light, Florida.....	1, 000
New York Slough light and fog signal, California.....	10, 000
Mermentau River light, Louisiana.....	7, 000
Willamette River, Oregon, 25 beacon lights and buoys between Salem and Portland.....	5, 000

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report, under specified headings, from which it will be evident that the Board has brought the numerous and varied aids to navigation under its charge up to the proper standard, and that it has done all that was possible, with the funds provided, to meet the requirements of commerce and navigation.

#### SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1895 was \$385,000. While the appropriation was the same as that of the previous year, the number of light-stations was increased, and it is reasonable to expect that appropriations will be made during the present session of Congress for still other light-stations.

The Board has found it impossible, with funds provided, to keep up its reserve stock of supplies with which to meet emergencies. This stock has been heavily drawn upon. The meagerness of preceding appropriations has made it necessary for the Board to cut down the quantity of supplies furnished yearly to the light-houses to such an extent that it can go no further without danger to the lights. In spite of the severe economy used, there is danger that the present lights and those which are being built can not be properly kept up without an

increase of appropriation. The passage of the eight-hour law has increased the price of the manufactured material used to supply light-houses. The Board therefore estimates that \$410,000 will be needed for providing supplies for light-houses during the coming fiscal year.

#### REPAIRS AND INCIDENTAL EXPENSES OF LIGHT-STATIONS.

The estimate submitted under this head is \$600,000. The appropriation for the current year is \$490,000. From this appropriation must be paid the cost of repairs and maintenance of all light-stations, numbering now some 1,014, many of which are very old, and therefore costly to maintain, as well as the cost of beacon lights to mark the ends of pierheads and at other localities on inland waterways and harbors. The law requires the Light-House Board to erect such beacon lights, but special estimates for this purpose can not be submitted in advance, since their erection usually depends upon the completion of piers and breakwaters, or the completion or progress of other works of improvement made by the Government to inland waterways. The cost of spare illuminating apparatus, which must be kept on hand to replace that which may be damaged or destroyed in service, is also paid from the appropriation for repairs and incidental expenses. Several estimates for special appropriations to make extensive renewals of buildings at light-stations have been omitted this year, since they can be done from the appropriation for general repairs if this is made sufficient. The amount asked is urgently needed for the efficient and economical maintenance of the service.

#### SALARIES OF LIGHT-HOUSE KEEPERS.

Last year Congress appropriated \$690,000 to pay the salaries of not exceeding 1,250 keepers. But 1,203 keepers were employed. In quite a number of instances the Board found itself unable to provide keepers for needed beacon lights which it had funds to build, and hence these lights were not established.

The statement made in the Board's last three annual reports in reference to this subject is repeated.

It has become necessary, in view of the great pressure on this appropriation, to temporarily omit filling certain vacancies as they occurred, where there was more than one keeper at a station. This has necessarily resulted in inferior service on the part of the overworked keepers remaining at those stations. Two men can not do the work of three properly for any extended term.

The duties of light-keepers have been greatly increased by the addition of steam fog-signal apparatus, requiring, in many cases, the attention of steam engineers. It has been found that it is impossible to obtain the services of men for many of these positions, for the pay offered, who hold certificates that they have passed examinations as steam engineers. Hence the Board has been unable to get the best results from its steam fog signals. The steam is not raised as soon as it might be so as to get the fog signal to sounding as soon as it should. The machinery gets out of order sooner than it would if in the charge of a skilled engineer. It remains out of use until a machinist is sent from a distant town at large expense in wages and

transportation to fix it, and the life of the machine is much shorter than it would be if in the charge of a certificated engineer. It is poor economy to stint the pay of engineers to such point that the services of only the poorest can be commanded, as it costs so much to remedy the mistakes they unavoidably make.

It has been found in practice that it is difficult to retain in the service men of sufficient experience and ability to operate and take the proper care of the delicate, complicated, and expensive illuminating apparatus placed in their charge. Hence it costs more than it formerly did, and more than it ought, to keep this apparatus in running order. The Board therefore suggests that it would be better, from an economical point of view, to raise the average salary of the light-keeper to the amount fixed by law rather than to maintain it at its present rate, and especially to decrease it still more.

The Board anxiously feels the difficulty with which it retains its trained and experienced light-keepers. The pay they receive is insufficient to induce them to remain in the service. During the four years between March 4, 1885, and March 4, 1889, 769 persons entered the service by original appointment. During the four years which elapsed between March 4, 1889, and March 4, 1893, 672 persons received original appointments into the Light-House Service. Each of these appointments was made to fill a vacancy made by cause. These causes were death, resignation, or removal. Each removal was made for specified written and recorded cause, and never for political reasons. The removals number, say, one in seven of all the vacancies. The vacancies caused by death are inconsiderable in number. The vacancies caused by resignation are, say, between five and six out of every seven.

Some of the light-stations are undermanned. At others, the more isolated, it is difficult to retain good men at the rates paid. The appropriations made do not permit the Board to pay the average rates allowed by law. But even on the present basis it is estimated that \$700,000 will be needed for salaries of light-keepers during the next fiscal year.

#### EXPENSES OF LIGHT-VESSELS.

Congress appropriated \$285,000 to defray the expenses of light-vessels during this fiscal year. The appropriation has been expended and many needed repairs go over to next year. The cost of the maintenance of the light-vessel which was established off Boston Bay, Massachusetts, in October, 1894, is to be defrayed by the appropriation for the coming year. The wear and tear on the older light-vessels was greater than usual, owing to their increased age. The Board estimates, therefore, that the expenses of light-vessels for the ensuing fiscal year will be \$350,000, and it is recommended that an appropriation of that amount be made therefor. Within the past two years the number of light-ships established has been increased by 33 per cent, but there has been no corresponding increase in appropriations necessary to meet the increased cost of maintenance.

#### EXPENSES OF BUOYAGE.

Congress at its last session appropriated \$415,000 for the expenses of buoyage during the current fiscal year. There are now some 4,725 buoys of all kinds in position. The buoys which were carried away or sunk at their moorings during the past year were replaced from the stock



## NEW LIGHT-STATIONS AND DEPOTS.

The estimates for special appropriations for new light-stations and depots have been revised with particular care to bring them up to date and to make them conform to the actual needs of navigation in the various districts throughout the coast and inland waters. Several estimates formerly submitted for special appropriations to rebuild or renew existing structures have been omitted, as such work can be done more advantageously under the general appropriation for repairs, provided the latter be made sufficient, and the special estimates are thereby reduced to a minimum.

## NEW LIGHT-VESSELS.

The Board has recommended in the proper places in the body of this report that appropriations be made for building six new light-vessels. Each is much needed, but attention is especially invited to the urgent necessity for a relief light-vessel in the Fourth light-house district.

## NEW TENDERS.

Recommendation is repeated in certain of the following pages that appropriations be made for the construction of three steamers to be used as light-house tenders in the Second, Third, and Seventh light-house districts to replace old steamers now so nearly worn out that they can only last, if used with care, until new vessels can be built to take their places.

## OIL HOUSES.

The Board again recommends that appropriation be made for the erection of small, inexpensive structures near to, but separate from, light-houses, in which to keep a year's supply of mineral oil, the illuminant now used by the Light-House Establishment. Last year the Board estimated that \$15,000 could be expended with great advantage during the year among the larger, more isolated, and more important light-stations. An appropriation of \$5,000 was made for that purpose, which will be expended during the current year.

It is estimated that \$10,000 will be needed and can be profitably expended in building oil houses during the coming fiscal year, and the appropriation of that amount is therefore recommended.

The recommendation made in the annual report for each of the last nine years was accompanied by the following explanation:

The substitution of mineral oil for lard oil in the light-house service, which has been in progress several years, is now finished. As the quantity of the oil now used is larger, and as its bulk is greater than was that of the oil formerly used, and as the mineral oil is much more likely to occasion fire, and indeed to take fire, than was the lard oil, the Board has come to the conclusion, in the interest of safety, to advise that the proper steps be taken to have a house erected at each of the larger stations, from a plan specially devised after a careful study, for the purpose.

## TELEPHONIC COMMUNICATION BETWEEN LIGHT-SHIPS AND SHORE.

The progress made in the Board's experiments looking to the use of sea telephones as a means of communication between its light-vessels and the shore is fully set out in the following report to the Board by its late superintending electric engineer, Prof. Lucien I. Blake, who obtained leave of absence from the State University of Kansas to do this work for the Light-House Establishment:

PHYSICAL LABORATORY, UNIVERSITY OF KANSAS,  
*September, 1895.*

SIRS: I have the honor to submit herewith my report upon the experiments in telephonic communication between Sandy Hook and the Scotland light-ship. These were carried on under the authority of the Board, and the purpose was to test practically a method proposed by the writer. Experiments were begun in August, 1894, and continued until July 1, 1895. During this period the work was frequently interrupted and prolonged by delays in constructing apparatus and in obtaining material. Nearly three months were unnecessarily consumed by the manufacturers in making the special cable for the grid; the difficulty of getting to and from the Hook and the light-ship in the winter season retarded progress, and the cold weather and rough water around the light-ship made experimenting from small boats difficult and slow. Work, however, was carried on as continuously as possible in the laboratory of the Light-House Establishment at Tompkinsville, on Staten Island Bay, on Sandy Hook, and around the light-ship. Nearly every point, in carrying out the methods described, had to be independently experimented upon. Nearly all apparatus had to be specially devised and constructed. It was anticipated that the electrical energy obtainable on shipboard would necessarily be an extremely small fraction of that delivered by the transmitter, and consequently every detail became important.

Account is here given of a second method also, upon which experiments in the preceding year had been made. Each method has its advantages and its warranty of success.

The difficulty of communicating electrically with light-vessels by direct metallic connection lies wholly in bringing the end of a submarine cable on board and maintaining it there under the various changes of the ship's position and against its motions. The fouling of the cable with the anchor chain has proven so far the chief insurmountable difficulty. Various devices to maintain cable connection with the ship have been made by the light-house authorities of several nations, and interesting accounts are recorded, particularly in the several reports of the British Royal Commission on Electrical Communication with Light-Houses. It may be stated that no method has yet been reported as successful.

In 1889 it occurred to my assistant and myself to make use of the ship's anchor chain as a part of the cable circuit, and experiments to this end were inaugurated in the summer of 1893 at the Buoy Depot at Woods Hole, Mass. Relief light-vessel No. 39 was anchored about a mile offshore in Vineyard Sound, and a temporary cable of No. 14 copper wire, okonite insulation, laid out to it. The core of this cable was connected with the stem of the mushroom anchor. The ship rode with 30 fathoms of 2-inch wrought-iron chain. Although the chain was new and was painted with asphaltum, still the friction between the links kept their contact surfaces bright, and sufficient electrical connection was established and maintained to deliver to suitable receiving telephones upon the ship a current ample for excellent talking. The so-called "solid-back" transmitter of the Bell Telephone Company was employed. The method was inspected by Capt. Frederick A. Mahan, U. S. A., engineer secretary of the Board; Commander George F. F. Wilde, U. S. N., then inspector second district; Mr. Arnold B. Johnson, chief clerk of the Board, and by others. The sea-



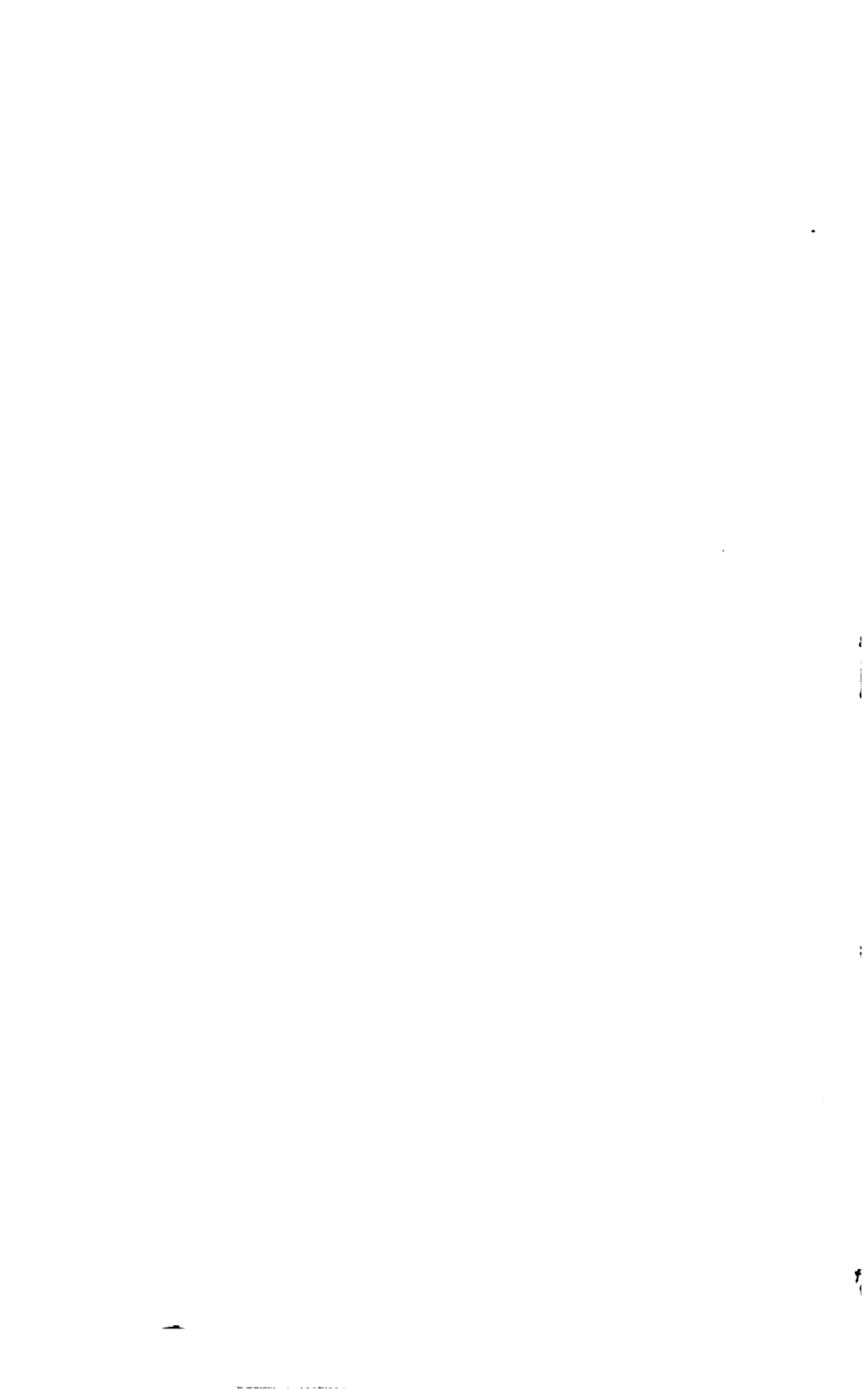
weed moving on the bottom in the rapid tidal currents of Vineyard Sound repeatedly broke the slender cable employed, necessitating frequent underrunning and relaying, and no attempt was made to continue the communication after the inspection.

The following winter the Popes Island Manufacturing Corporation, of New Bedford, Mass., made for the writer a 5-fathom chain of one-half inch Howard metal, which is noncorrodible in sea water and whose electrical conductivity is about that of brass. This experimental chain, when submerged, conducted, so far as practical results are concerned, apparently as well as a continuous insulated cable. Unfortunately, to the present time no successful method is known of welding this metal into links sufficiently heavy for anchor purposes. Its tensile strength, as shown from tests at Watertown arsenal, is reported to be about 90,000 pounds to the square inch, and this property, coupled with its noncorrodibility, would make it of special value for light-vessel anchor chains, independently of its service in electrical communication. From the experiments of 1893 there is encouragement to believe that through the ship's anchor chain, and quite surely so if it be of noncorrosive metal, such as the Howard, telephone connection can be established by the above method, and such method would be the simplest possible for light-ships.

In the following summer (1894) experiments were made upon another method of telephoning to light-ships, and in the course of these, incidentally, an observation was made upon the above-described chain method. A submarine cable 5 miles long, which was in use for experiment, became fouled with the Scotland light-ship anchor chains. Its copper core came into metallic contact with the chain about 60 fathoms from the ship. A receiving telephone, which was connected with the hawse pipe of the ship and thereby directly with the anchor chain, became so loud as to be heard everywhere in the ship's cabin and indicated direct metallic connection through to the shore. To determine if this was the case, an insulated wire was then connected directly with the core of the cable and brought on board, and matters so arranged that the telephone could be alternately cut into the cable circuit either through the insulated wire or through the hawse pipe connection and anchor chain. No decisive difference in the loudness of the telephone could be detected. It seemed right to conclude, therefore, that the current passed through a portion of the anchor chain. Other experiments under way have precluded, to this time, further tests upon this chain method. Sufficient has been done, however, to encourage the belief that the anchor chain may be successfully used to complete electrically the cable circuit.

The second method, which has been alluded to as being experimented upon in 1894, will be designated the diffusion method. It, like the chain method, was devised by us to avoid bringing the end of a submarine cable from the sea bottom up on board ship. The anchor chain was not made part of the telephone circuit in this method, but the entire region of water in which the ship could swing was electrified in such a way by the telephone current as to present differences of potential at different points in its area sufficient for telephonic purposes. By order of your Board the experimental plant which was to test the method was located off Sandy Hook, N. J., a place convenient to the shops of the Department at Tompkinsville, and in ordinary weather easily accessible to the light-house tenders. The Scotland light-vessel was selected with which to establish communication. This was  $4\frac{1}{2}$  miles offshore, in  $10\frac{1}{2}$  fathoms mean low water. It was not the intention to establish permanent communication with this vessel, as communication at this point would not be of particular service to the Department.

The method in general was carried out in the following manner: An iron-armored submarine cable was laid from Sandy Hook, at the power station of the Gedney Channel Electric Buoy System, out to the Scotland light-ship, 5 statute miles, of which one-half mile was underground across the Hook. This cable terminated in a junction box on the sea bottom, about 900 feet from the mushroom mooring anchor of the light-ship. The location of the light-ship and the course of the cable are shown in the accompanying map, Pl. I. The cable was a portion of that used at the World's



**Ninth District.**

range lights and a steam fog signal on or near Plum Island in the *Porte des Morts* (Death's Door) passage, entrance to Green Bay. Proper measures are being taken to do this as soon as practicable.

*1440. Poverty Island, Lake Michigan, Michigan.*—A circular iron oil house was erected in September, 1894. A boat landing was built in the shape of an L, so as to form a harbor for the keeper's boat. An additional crib was built to form a breakwater to the new landing. Various repairs were made.

— *Manistique, Lake Michigan, Michigan.*—The following statement, made in the Board's last annual report, is repeated:

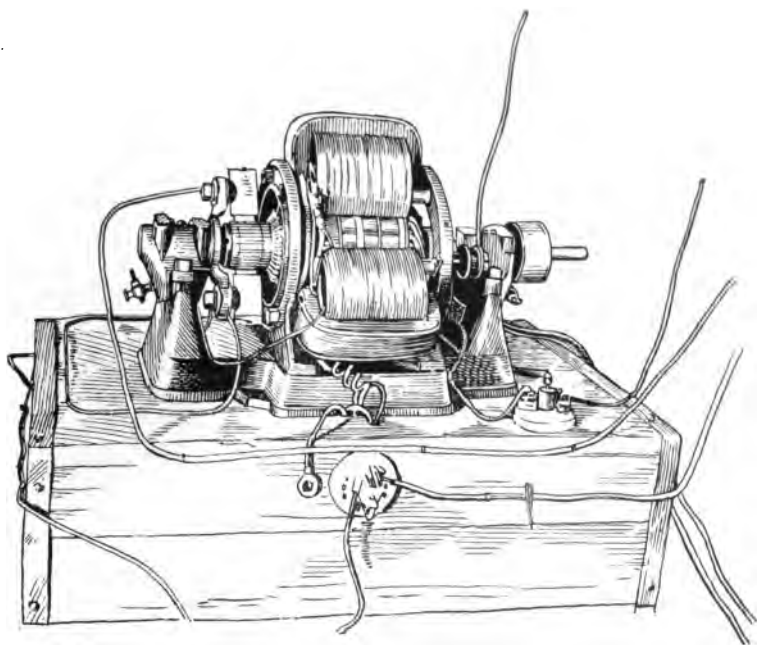
The establishment of a coast light and fog signal here, at a cost not to exceed \$32,000, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that the amount named be appropriated.

*1441. Seul Choix Pointe, Lake Michigan, Michigan.*—Provision was made for completing this station by the act approved August 18, 1894, making the \$5,000 appropriated August 5, 1892, for moving St. Marys River upper range lights available therefor. An estimate of cost for completing the tower and dwelling was made, and bids were invited and opened on March 9, 1895, for the materials, which were purchased, with supplies for the working party, and loaded on the tender *Amaranth*, and the working party was organized and transported to the light-house site, and operations were begun. The interior of the dwelling was largely replastered; the elevator and hoisting engine for handling material for the tower were placed; the boathouse was nearly finished; the oil house was completed; the tower was built up from 20 feet 8 inches above grade to 56 feet 4 inches; stone for the circular windows was cut and set in place, and the circular stairs and landings to the third platform were completed. By the act approved March 3, 1893, an appropriation of \$3,300 was made for completing the fog signal, but no money had been previously appropriated. The act approved August 18, 1894, appropriated \$2,200 for beginning the fog signal. Plans, specifications, and estimate of cost of establishing the fog signal were made. The material required for this work was ordered and delivered by the *Amaranth*. Contracts were made for furnishing two fog-signal boilers. Excavations for the fog-signal house were made, concrete footings were put in, walls were built up to the roof plates, and the exterior of the foundation walls was plastered to grade with cement mortar. The roof and cornices were completed, ironed, and painted, the floor was filled in, the site was graded, and a brick foundation was prepared for the boilers.

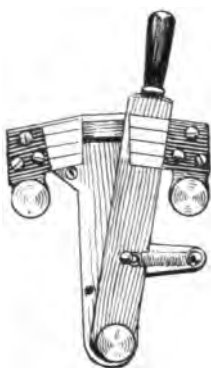
*1445. Escanaba, Green Bay, Michigan.*—Various repairs were made. The following recommendation was made in the Board's last five annual reports:

A steam signal here is not essential, as the navigation of Little Bay de Noquette is quite unobstructed, and with a steam whistle on Eleven-Foot Shoal a vessel should













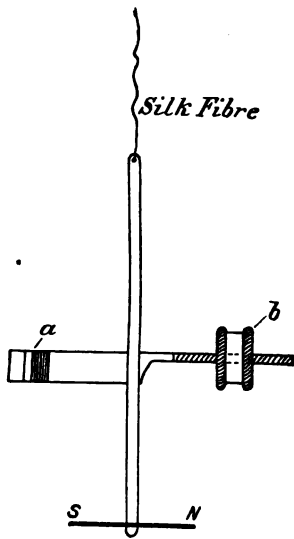


Fig. 1.

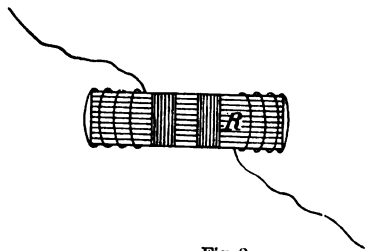
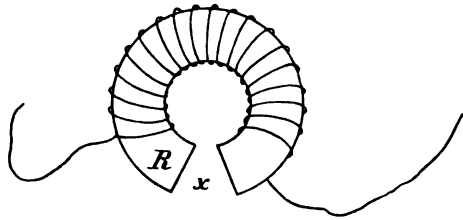
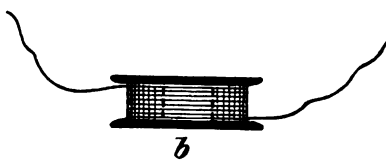
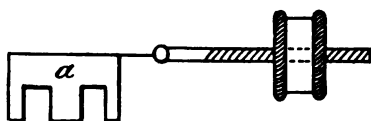
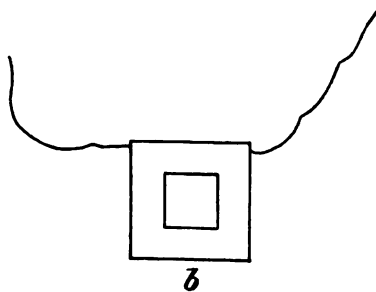
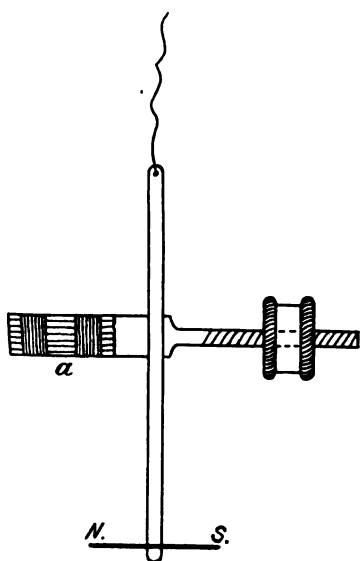
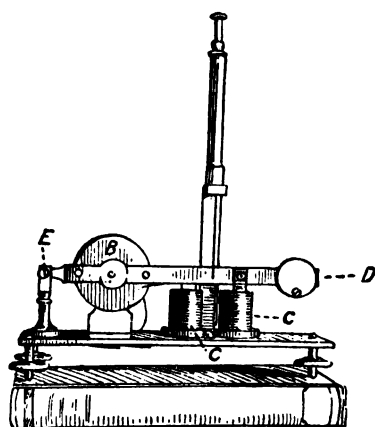


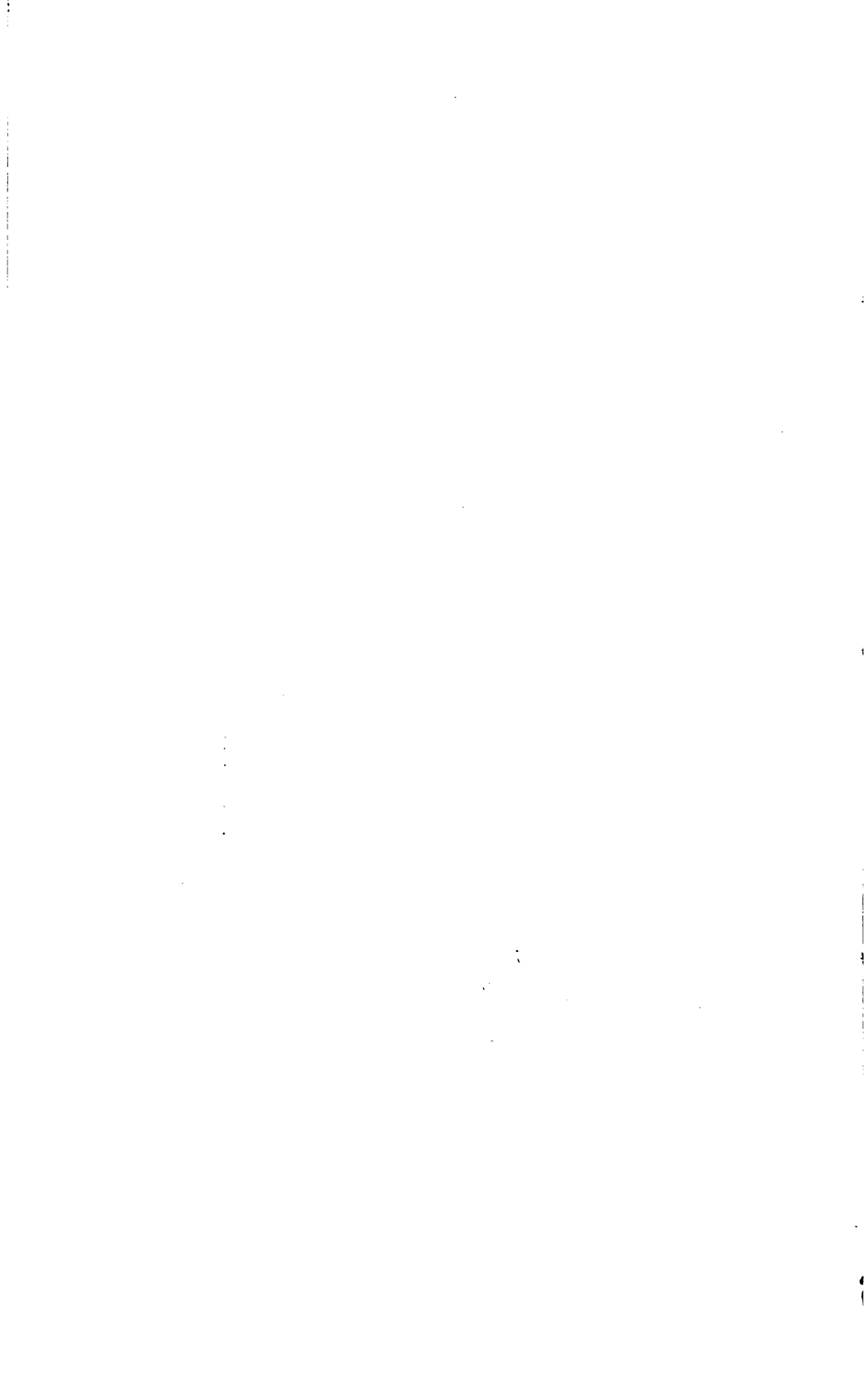
Fig. 2.

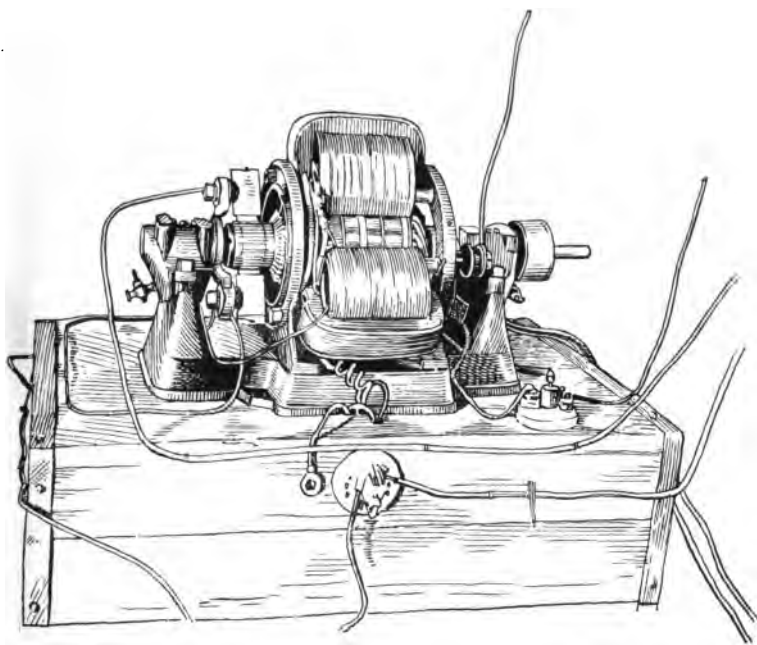






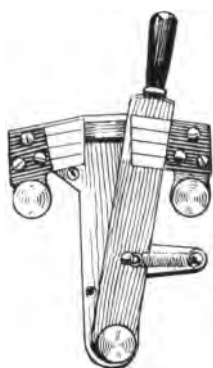














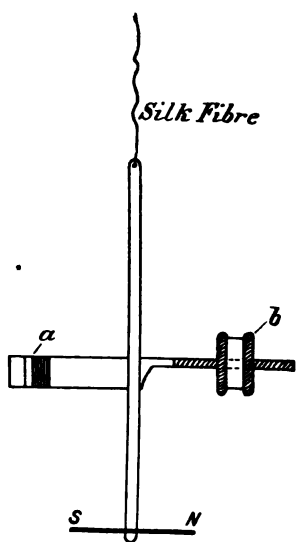


Fig. 1.

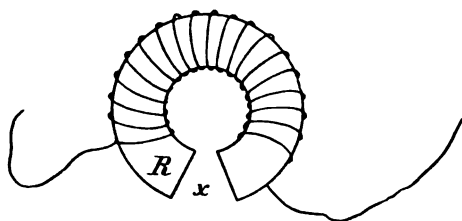
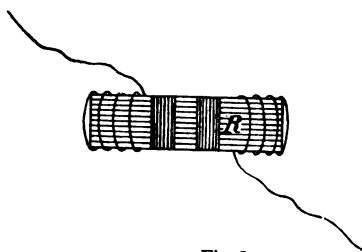
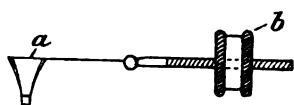
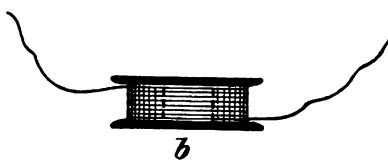
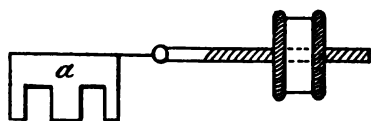
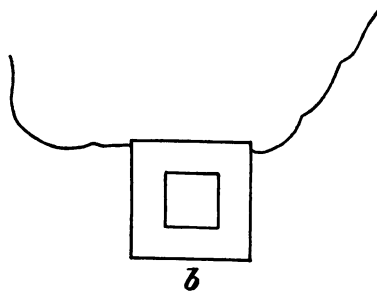
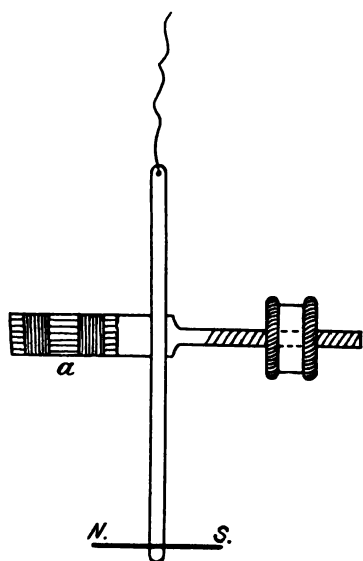


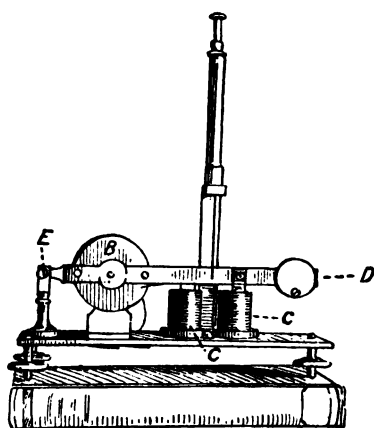
Fig. 2.





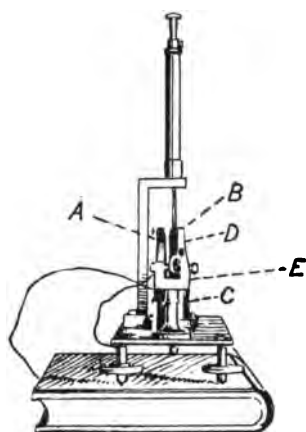


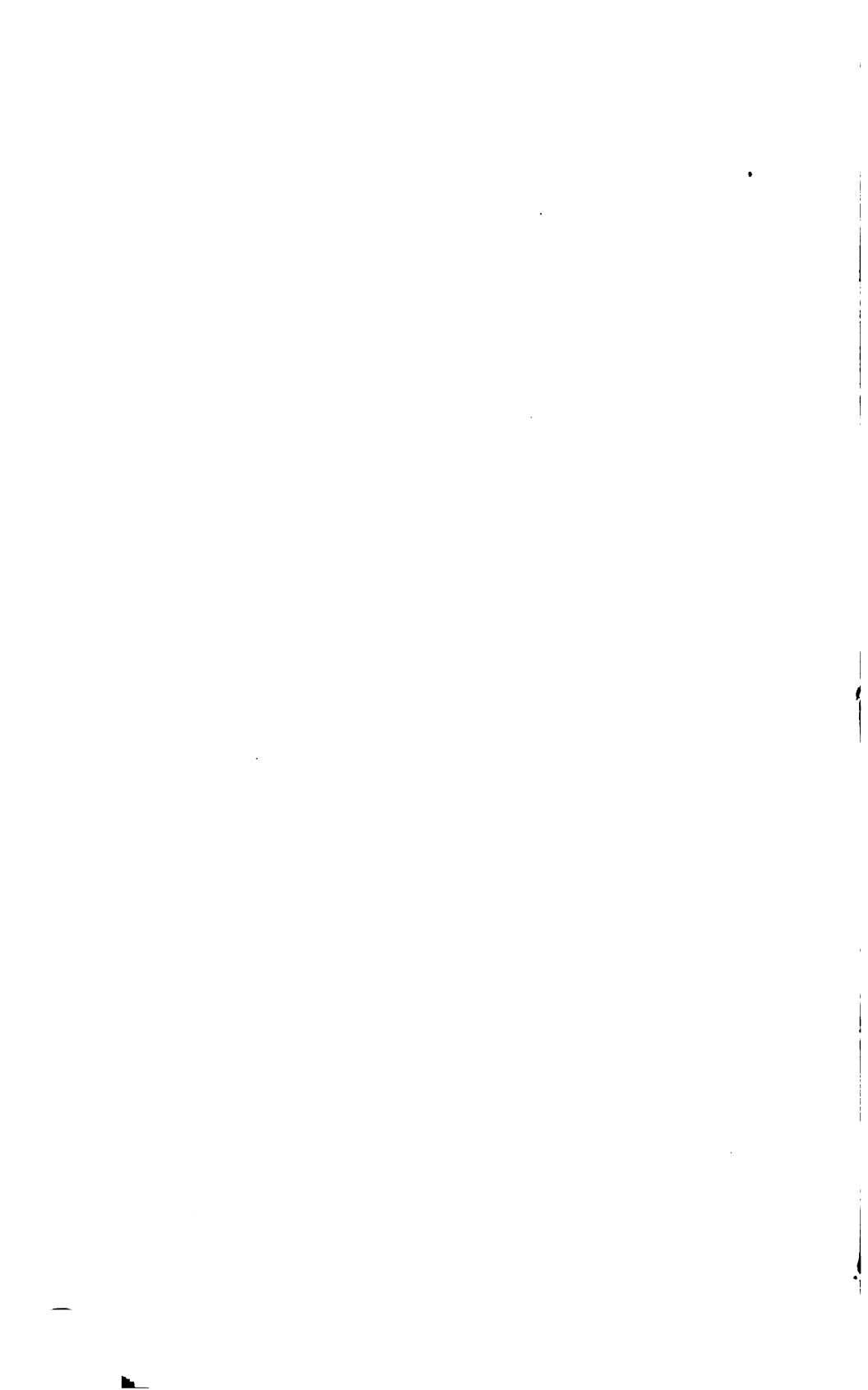


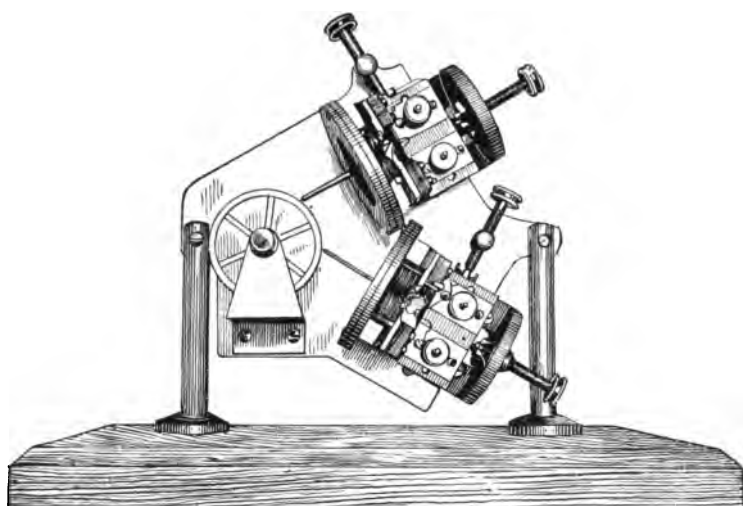




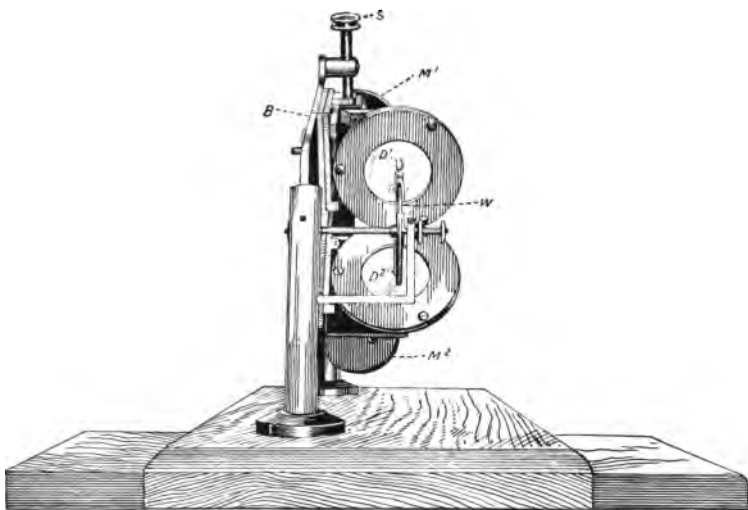


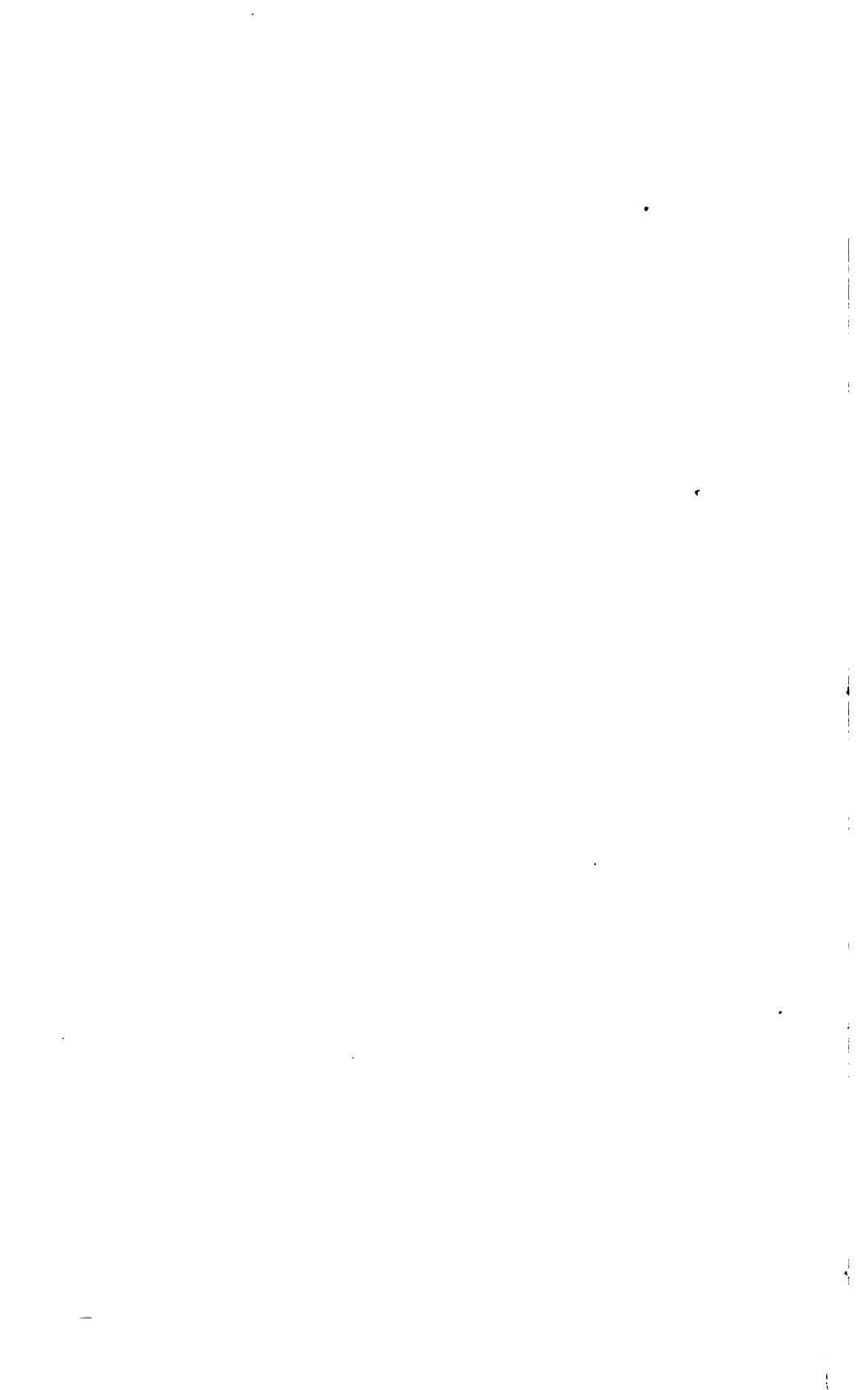












## FOG-SIGNAL EXPERIMENTS.

The valuable and interesting experiments and investigations in regard to the laws of sound in their bearing upon fog signals or audible aids to navigation, the results of which, up to the date of the last annual report of the Board, were given in an elaborate report by Maj. W. R. Livermore, engineer of the First and Second light-house districts, have been continued by that officer, so far as the funds available and the requirements of the regular work of the service would permit.

Additional machinery has been set up at the experimental station at Boston light, and tests and observations have been made as opportunity offered at regular stations.

These experiments and observations related to the effects of temperature in refracting sound, to the causes of the faint sounds or "aerial echoes" that are often noticed when a fog signal is operating, to the exploration of the upper air by means of self-recording meteorological instruments sent up by kites, and to the practical installation of a fog bell mounted on a buoy and operated by an electric current conveyed through a submerged cable, the current being controlled by an apparatus on shore.

Tests have been made with various appliances designed to aid the ear in hearing distant and faint sounds, and measures have been taken to devise and test an apparatus for generating sound by means of alternating electrical currents.

Various patterns of oil engines for operating air compressors for fog signals have been procured for test, and some important improvements have been made in fog bells and the striking apparatus used with them.

These experiments are to be continued.

## ESTIMATES OF GENERAL APPROPRIATIONS.

Supplies of light-houses .....	\$410,000.00
Repairs of light-houses .....	600,000.00
Salaries of keepers of light-houses .....	700,000.00
Expenses of light-vessels .....	350,000.00
Expenses of buoyage .....	500,000.00
Expenses of fog signals .....	125,000.00
Inspecting lights .....	5,000.00
Lighting of rivers .....	350,000.00
Survey of light-house sites .....	1,000.00

## ESTIMATES FOR SPECIAL APPROPRIATIONS.

Spring Point Ledge light and fog-signal station, Maine .....	\$25,000.00
Whitlocks Mill light-station, Maine .....	250.00
Libby Islands light-station, Maine, keeper's dwelling .....	6,000.00
Boon Island light-station, Maine, keeper's dwelling .....	3,400.00
Cape Elizabeth light-station, Maine, keeper's dwelling .....	2,000.00
Matinicus Rock light-station, Maine, keeper's dwelling .....	3,200.00
Burnt Coat Harbor light-station, Maine, roadway .....	500.00
Tender for the Second light-house district .....	85,000.00

## FIRST DISTRICT.

This district extends from the head of navigation on the St. Croix River, Maine, the northeastern boundary of the United States, to, and including, Hampton Harbor, New Hampshire. It embraces all aids to navigation on the seacoast of Maine and New Hampshire, and on all tidal waters between the limits named.

*Inspector.*—Commander George E. Wingate, United States Navy.

*Engineer.*—Maj. William R. Livermore, Corps of Engineers, United States Army.

In this district there are—

Light-houses and beacon lights.....	64
Day or unlighted beacons.....	103
Fog signals operated by steam or hot-air engines.....	13
Fog signals operated by clockwork.....	17
Whistling buoys in position.....	11
Bell buoys in position.....	18
Other buoys in position.....	635
Steamer <i>Lilac</i> , buoy tender, and for supply and inspection.....	1
Steamer <i>Myrtle</i> , for construction and repair in the First and Second districts....	1

The number preceding the name of a light-station is that by which it is designated in the list of lights and fog signals on the Atlantic and Gulf coasts of the United States, corrected to January 1, 1895, or in the list of lights and fog signals on the Pacific coast of the United States, corrected to January 1, 1895, or in the list of lights and fog signals of the United States on the Northern lakes and rivers, corrected to the opening of navigation, 1895.

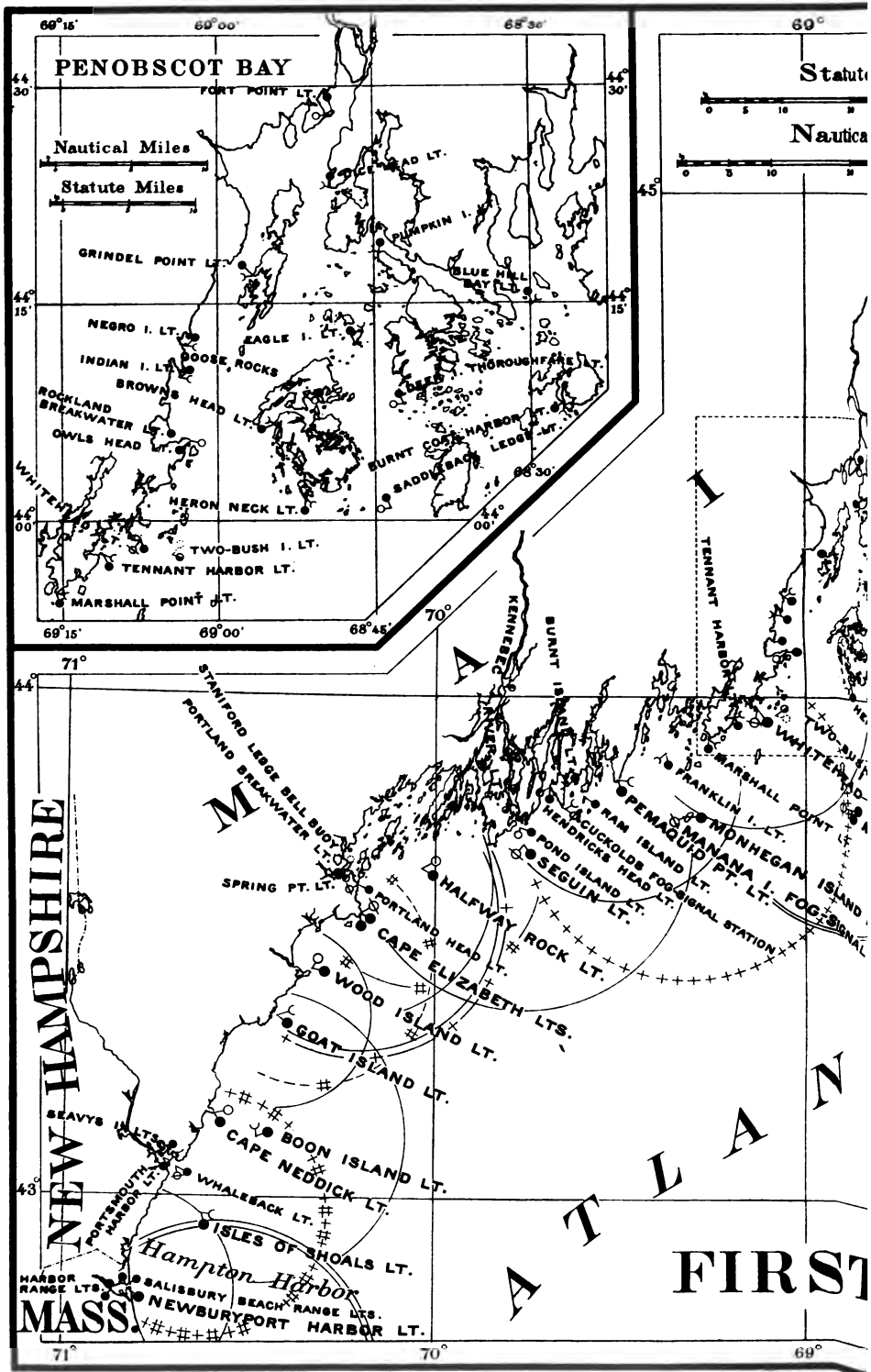
## LIGHT-STATIONS.

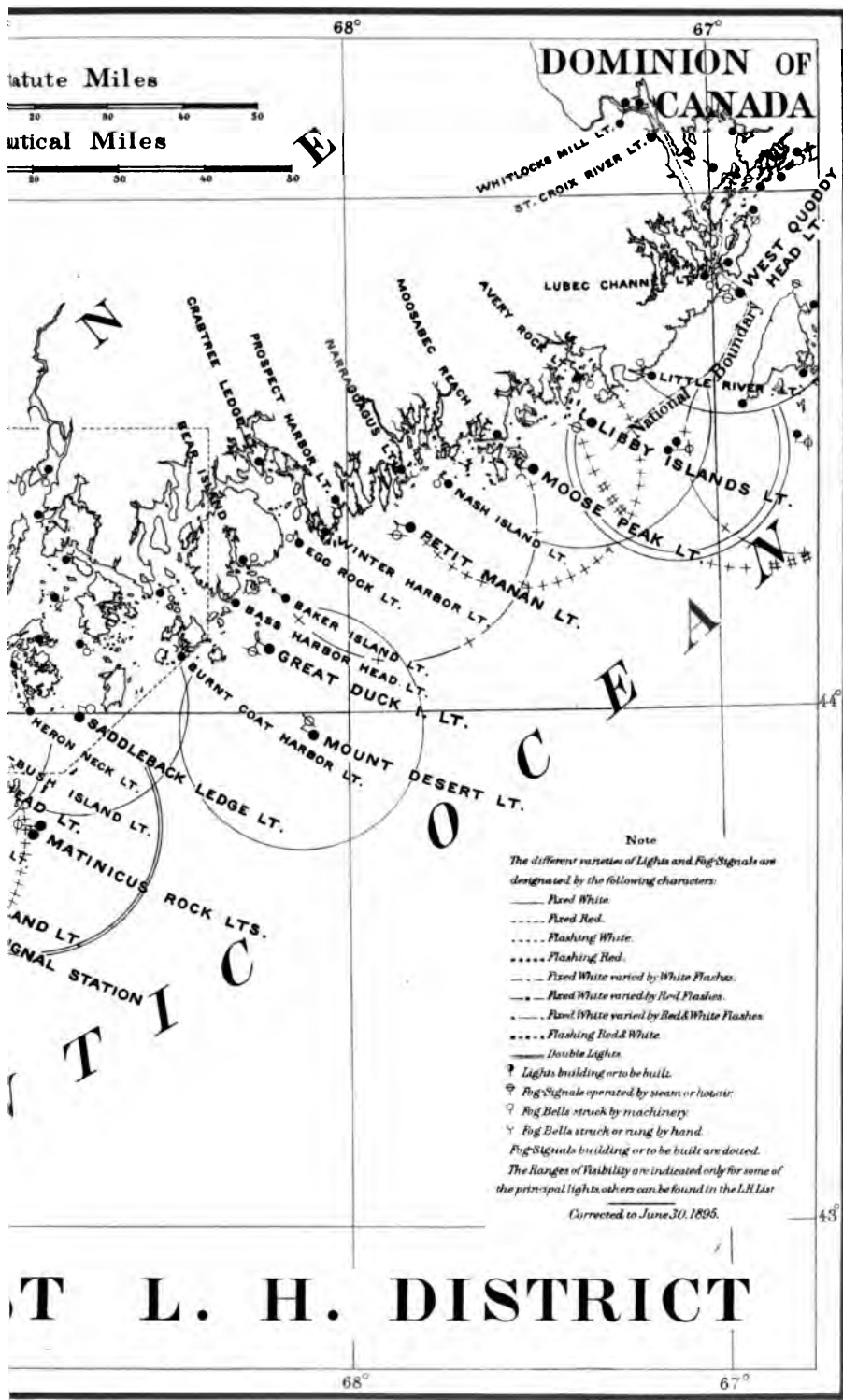
1. *Whitlocks Mill, on the south bank of the St. Croix River, Maine.*—The following recommendation, made in the Board's last annual report, is renewed:

A light was needed at this place to enable the steamers plying between Eastport and Calais, and especially towboats, to make the difficult turn at the Narrows, a few hundred yards above Whitlocks Mill. The Canadian Government maintains two lights on the left or Canadian bank of the river, and another light was needed on the right or American bank to make the navigation safe at this difficult turn. Hence a red light was, on July 15, 1892, shown from a tree as a temporary expedient. It is now proposed to purchase a site for this light. The owner of the land offers it at a reasonable price. It is estimated that its purchase, together with the legal

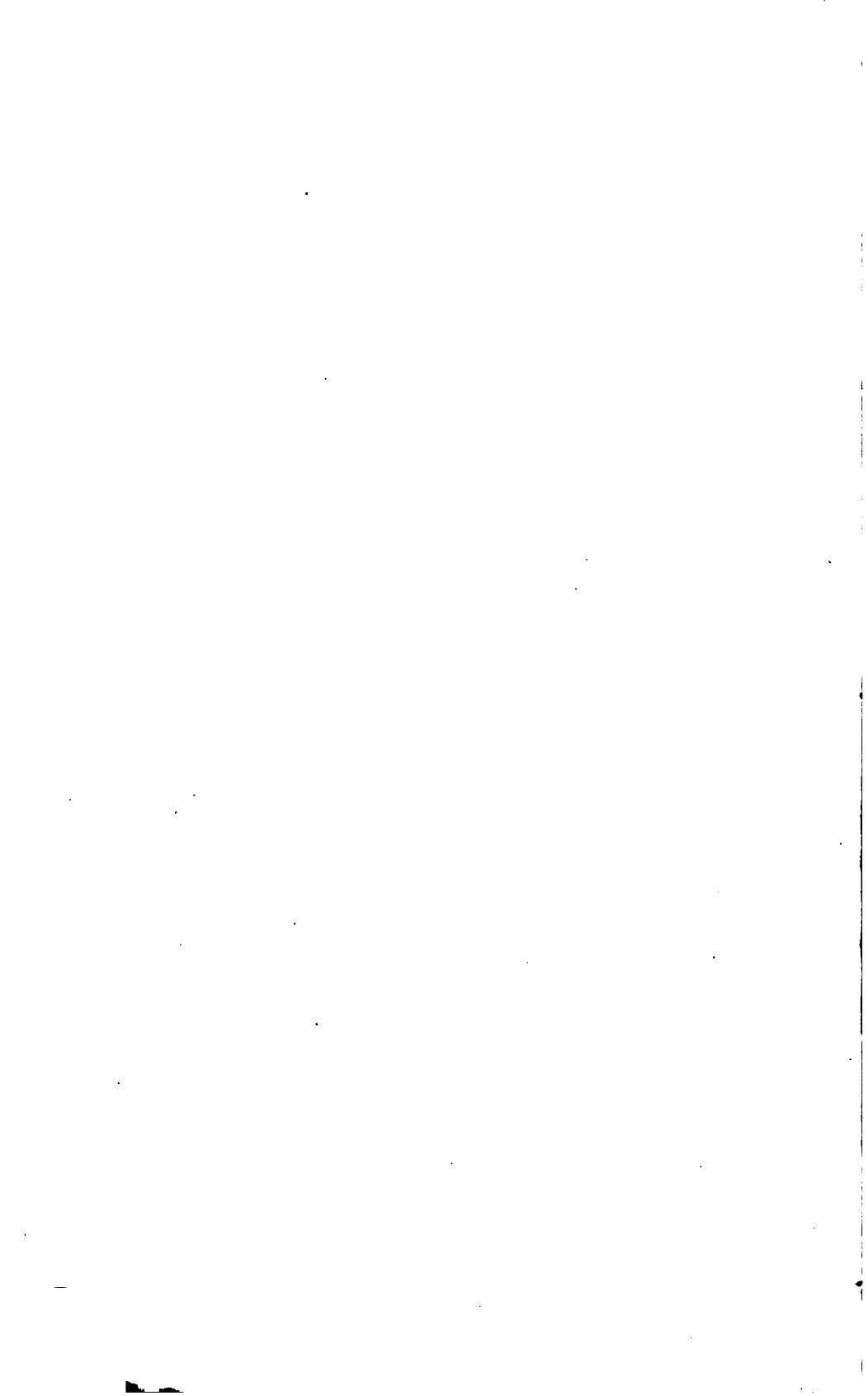








# L. H. DISTRICT



**First District.**

expenses necessary to obtaining title and cession of jurisdiction, will cost not to exceed \$250. Recommendation is made that an appropriation of that amount be made for this purpose.

2. *St. Croix River, on Docket Island, Maine.*—A new cistern was built in the cellar and a concrete floor was laid. Various repairs were made.

6. *Avery Rock, in Machias Bay, Maine.*—A bulkhead of heavy timbers well bolted to the ledge was built on the east side of the rock to protect the dwelling house from the sea. Heavy shutters were made and hung. Various repairs were made. The characteristic of the fog signal was changed from a blow struck every 11 seconds to a blow every 10 seconds.

7. *Libby Islands, on southwest end of the southwesterly of the Libby Islands, entrance to Machias Bay, Maine.*—Since the recommendation of the last three years for an appropriation for a single dwelling for an assistant keeper, it has become necessary to provide quarters for another assistant, making two sets of quarters urgently needed, as there is now but one set for three keepers. It is therefore recommended that a double dwelling be built, at an estimated cost of \$6,000, instead of the single dwelling heretofore recommended.

10. *Nash Island, off the mouth of Pleasant Bay, Maine.*—An oil house was built and minor repairs were made.

12. *Petit Manan, seacoast of Maine.*—A platform was built at the side of the boat slip. Various repairs were made.

15. *Mount Desert, on Mount Desert Rock, about 20 miles to southward of Mount Desert Island, Maine.*—The boathouse was enlarged and rebuilt and a platform was built at the side of the boat slip. The fog-signal machinery was overhauled and repaired.

16. *Egg Rock, on Egg Rock, Frenchman Bay, Maine.*—The boat slip was extended seaward 35 feet and was provided with a hard-wood capping. Various repairs were made.

17. *Crabtree Ledge, Frenchman Bay, Maine.*—A landing ladder was made and fitted. Various repairs were made.

18. *Baker Island, off Mount Desert Island, Maine.*—An oil house was built. Minor repairs were made.

19. *Great Duck Island, seacoast of Maine.*—A boat slip and boathouse were built. Fog-signal boilers were connected with the sea to provide a water supply in case of drought. Various repairs were made.

21. *Bass Harbor Head, entrance to Bass Harbor, Maine.*—A boat winch was furnished. Minor repairs were made.

22. *Burnt Coat Harbor, Swan Island, coast of Maine.*—An oil house was built. A flight of steps was built leading up the bank to the boathouse. Minor repairs were made.

**First District.**

The following recommendation, made in the Board's last annual report, is renewed:

This station is situated at the extreme end of the peninsula and is separated from the town by the harbor. In winter the harbor is sometimes filled with ice, so that communication with the town by water can not be relied upon; a roadway for the accommodation of the necessary travel between the public road and the light-station is therefore necessary. The owners of the adjacent land offer to convey right of way to the Government at a nominal price. It is estimated that the legal expenses of obtaining title and cession of jurisdiction to the land thus conveyed, together with the cost of building the road needed, will not exceed \$500. Recommendation is made that an appropriation of this amount be made therefor.

*24. Saddleback Ledge, 3 miles westerly from Isle au Haut, Maine.*—The boat slip was extended seaward 40 feet, and a branch boat slip, 35 feet long, was made. An iron ladder was put in the tower. Various repairs were made.

*25. Deer Island Thoroughfare, on Mark Island, Maine.*—An oil house and a fuel house were built. Various repairs were made.

*27. Eagle Island, at the northeast extremity of Eagle Island, Maine.*—An oil house was built. A flight of stairs was built up the bluff on the southeast side of the reservation.

*30, 31. Matinicus Rock, on Matinicus Rock, off the southern entrance to Penobscot Bay, Maine.*—The following recommendation was made in the Board's last four annual reports:

For more than twenty years, and until recently, the first assistant keeper was the son of the principal keeper, and the two lived together in one dwelling. The resignation of the principal keeper has broken up this arrangement. At this important station, which has two second-order lights and a steam fog signal, a keeper and three assistant keepers are employed. These are the only people living on this rock. Two of the assistant keepers, with their families, live in one double dwelling, and the principal keeper lives in a separate single dwelling. These three sets of quarters are adapted only to the accommodation of three families, and a fourth set of quarters is, therefore, urgently necessary for the third assistant.

It is estimated that a proper dwelling can be built for \$3,200, and recommendation is made that this amount be appropriated for that purpose.

This bar rocky islet is about half a mile long and of irregular width, nowhere exceeding an eighth of a mile, and the highest part is not more than 50 feet above the sea level. There is a little cove where material can be hauled up in pleasant weather, but it has no harbor. The light-house keeper effects a landing by steering his boat through the breakers on the top of a wave, so that it will land on the boatways, where his assistants stand ready to receive him and draw his boat so far up on the ways that a receding wave can not carry it back to the sea. There is neither tree nor shrub, and hardly a blade of grass on the rock. The surface is rough and irregular, and resembles in a large way a confused pile of loose stone. Portions of the rock are frequently swept by the waves, which move the huge boulders into new positions. During the storm of January 19, 1856, the sea made a complete breach over the rock, washing away every movable thing. The old dwelling was so thoroughly demolished that not one stone was left upon another. The then new dwelling, though situated in the most protected spot, was flooded, and heavy wooden shutters had to be closed to prevent the violence of the spray from breaking them in. The rock is about 20 miles from the mainland, as the crow flies. Rockland, 25 miles

**First District.**

distant, is the nearest harbor unless the coves of Matinicus Island, 4 miles from the rock, be considered as harbors. They can be entered only with certain winds by vessels of very light draft. The isolation of this station and the difficulty of landing material here of course enhance the cost of erecting the proposed structure, in which strength rather than the graces of architecture are most considered.

32. *Two Bush Island, entrance to West Penobscot Bay, Maine.*—An appropriation of \$19,000 was made on August 18, 1894, for the establishment of this station. As it is impracticable to buy the island, measures have been taken to obtain title to it by proceedings in condemnation.

34. *Owls Head, entrance to Rockland Harbor, Maine.*—An oil house was built. A boathouse and boat slip were built, and a boat winch was provided. Stairs and platforms leading from the dwelling to the light tower were rebuilt. Minor repairs were made.

36. *Browns Head, entrance to Fox Island Thoroughfare, Maine.*—A boathouse and boat slip were built, and a boat winch was provided. Minor repairs were made.

38. *Negro Island, entrance to Camden Harbor, Maine.*—An oil house was built.

40. *Dice Head, entrance to Castine Harbor, Maine.*—An oil house was built. Materials for repairing the dwelling and outbuildings were landed.

42. *Tennant Harbor, on Southern Island, Maine.*—A fuel house was built. Minor repairs were made.

43. *Marshall Point, entrance to St. George Harbor, Maine.*—A boundary fence was built. Minor repairs were made. The dwelling was struck by lightning in June and badly damaged, and a contract has been entered into for rebuilding it.

44. *Monhegan Island, seacoast of Maine.*—Storm porches were built at each of the dwellings. Minor repairs were made.

45. *Manana Island fog-signal station, seacoast of Maine.*—The old summer kitchen was enlarged and repaired and made into quarters for the assistant keeper. The disused signal-house was made into a fuel house. A wire cable for carrying coal was put up between the boathouse and the top of the hill, and a small engine was set up for hauling the car. Various repairs were made.

46. *Franklin Island, Muscongus Bay, Maine.*—An oil house was built. A cistern was provided for the keeper's use. Minor repairs were made.

— *Doubling Point, Ames Ledge, Perkins Island, Squirrel Point, and Ram Island, Lower Kennebec River, Maine.*—An appropriation of \$17,000 was made by the act approved on March 2, 1895, for the establishment on Kennebec River, Maine, of a light, range lights, and fog signal at or near Doubling Point, a light at Ames Ledge, a light at or near the southwest point of Perkins Island, a light at or near Squirrel Point,

**First District.**

and a day beacon on or near Ram Island, and for their sites. Proper measures are being taken for obtaining sites for these aids to navigation, and for having plans made for their erection.

49. *Burnt Island, entrance to Boothbay Harbor, Maine.*—A new bell tower was built, a 1,000-pound bell was purchased, and a Gamewell machine was procured. Various repairs were made.

50. *Cuckolds fog-signal station, entrance to Boothbay, Maine.*—The machinery was overhauled and repaired. A 1,000-pound bell was installed, to be used while getting up pressure of air on the Daboll trumpet.

51. *Hendricks Head, mouth of Sheepscot River, Maine.*—An oil house was built. Various repairs were made.

52. *Pond Island, Kennebec River, Maine.*—The characteristic of the fog signal was changed from  $8\frac{1}{2}$  seconds to 10 seconds. Minor repairs were made.

53. *Seguin, off the mouth of the Kennebec River, Maine.*—A railroad was built connecting the boathouse at the landing with the signal house. A car was provided and a hoisting engine was set up for hauling up coal and supplies. A platform of heavy planks and timber was built at the boat slip. Extensive repairs were made to the dwellings, outbuildings, and reservoirs.

55, 56. *Cape Elizabeth, on Cape Elizabeth, Maine.*—The following recommendation was made in the Board's last four annual reports:

Until the resignation of the principal keeper, about two years ago, his wife was an assistant keeper, so that there were but three families to be accommodated in the three single dwellings at the station. This arrangement is changed, and there are now four separate families at the station, and two families are crowded into a dwelling adapted in size and arrangement to only one family. The two towers are more than 900 feet apart; two of the dwellings are near the northeast and one near the southwest tower. A fourth dwelling is very urgently needed near the latter to properly and conveniently house in the severe winter weather of that climate the second of the two assistants who attends the light in it. Besides a first and a second order light, the station has a first-class fog signal, and an additional dwelling is imperatively needed in the best interests of the service.

It is estimated that one can be built for \$2,000, and it is recommended that an appropriation of this amount be made therefor.

— *Spring Point Ledge, Portland Harbor, Maine.*—Congress, by act approved March 2, 1895, appropriated \$20,000 for establishing a light and fog-signal station at this point, and authorized a contract therefor which shall not exceed \$45,000, the amount which it is estimated that this light-station will cost. It is recommended that the remaining \$25,000 be now appropriated for that purpose. Proper measures are being taken to obtain title to the site needed and for making plans for the necessary structures.

62. *Boon Island, seacoast of Maine.*—The following recommendation was made in the Board's last four annual reports:

There are at this station one keeper and two assistants, and but two sets of quarters in one double dwelling. The second assistant keeper has to board either with



**First District.**

the family of the keeper or with that of the first assistant keeper. This forced arrangement is unsatisfactory to all, and is quite unfavorable to the retention of a second assistant of the needed qualifications. The station is isolated and exposed, the tower is tall, and this second-order light is an important one.

A third dwelling, which is urgently needed, it is estimated can be built for \$3,400. It is therefore recommended that an appropriation of this amount be made therefor.

**REPAIRS.**

Repairs more or less extensive were made during the year at the following-named stations:

- |                              |                              |
|------------------------------|------------------------------|
| 1. Whitlocks Mill, Me.       | 41. Fort Point, Me.          |
| 3. Lubec Channel, Me.        | 47. Pemaquid Point, Me.      |
| 4. West Quoddy Head, M       | 48. Ram Island, Me.          |
| 5. Little River, Me.         | 54. Halfway Rock, Me.        |
| 7. Libby Islands, Me.        | 55, 56. Cape Elizabeth, Me.  |
| 8. Moose Peak, Me.           | 57. Portland Head, Me.       |
| 9. Moosabec Reach, Me.       | 58. Portland Breakwater, Me. |
| 13. Prospect Harbor, Me.     | 59. Wood Island, Me.         |
| 14. Winter Harbor, Me.       | 60. Goat Island, Me.         |
| 26. Goose Rocks, Me.         | 61. Cape Neddick, Me.        |
| 28. Pumpkin Island, Me.      | 62. Boon Island, Me.         |
| 30, 31. Matinicus Rock, Me.  | 63. Whaleback, N. H.         |
| 33. Whitehead, Me.           | 65, 66. Seavys Island, Me.   |
| 35. Rockland Breakwater, Me. | 67. Isles of Shoals, N. H.   |
| 37. Indian Island, Me.       |                              |

**DAY OR UNLIGHTED BEACONS.**

The 103 day beacons in this district are in fair order.

*Anderson Ledge, Isles of Shoals, Maine.*—The day mark was replaced.

**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

4. *West Quoddy Head, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,266 hours during the year, and consumed about 66 tons of coal.

7. *Libby Islands, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,521 hours during the year, and consumed about 66 tons of coal.

12. *Petit Manan, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,918 hours during the year, and consumed about 74 tons of coal.

15. *Mount Desert, Maine.*—This third-class Daboll trumpet, in duplicate, was in operation some 1,524 hours during the year, and consumed about 7 tons of coal.

19. *Great Duck Island, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,362 hours during the year, and consumed about 59 tons of coal.

**First District.**

30, 31. *Matinicus Rock, Maine*.—The signals of this station, a 10-inch and a 12-inch steam whistle, were in operation some 1,451 hours, and consumed about 72 tons of coal.

32. *Whitehead, Maine*.—This 10-inch steam whistle, in duplicate, was in operation some 1,933 hours during the year, and consumed about 74 tons of coal.

45. *Manana Island, Maine*.—This first-class Daboll trumpet, in duplicate, was in operation some 1,233 hours during the year, and consumed about 15 tons of coal.

50. *Cuckolds Island, Maine*.—This first-class Daboll trumpet, in duplicate, was in operation some 1,103 hours during the year, and consumed about 7 tons of coal.

53. *Seguin, Maine*.—This 10-inch steam whistle, in duplicate, was in operation some 1,317 hours during the year, and consumed about 55 tons of coal.

55, 56. *Cape Elizabeth, Maine*.—The signals are a second-class steam siren and a 12-inch steam whistle. The second-order siren was in operation some 922 hours during the year, and consumed about 41 tons of coal. The 12-inch steam whistle was not used during the year.

57. *Portland Head, Maine*.—This second-class Daboll trumpet, in duplicate, was in operation some 1,013 hours during the year, and consumed about 14 tons of coal.

63. *Whaleback, New Hampshire*.—This third-class Daboll trumpet, in duplicate, was in operation some 1,010 hours during the year, and consumed about 7 tons of coal.

**BUOYAGE.**

There were established during the year 12 spar buoys and 5 iron buoys, including Green Island Seal Ledges whistling buoy, in West Penobscot Bay. There were discontinued 13 spar buoys and 6 iron buoys, including Carlow Island boundary line buoy, St. Croix River, marking the boundary line between Maine and New Brunswick; also Dyers Halftide Ledge Spindle in Narraguagus Bay.

The following named changes were made in the coloring and numbering of the buoys in this district, viz:—

Sheep Island Shoals buoy, Fisherman Island Passage, West Penobscot Bay, was changed from a black spar No. 1 to a red spar No. 2.

Grindstone Ledge buoy, Fisherman Island Passage, West Penobscot Bay, was changed from a red spar No. 2 to a black spar No. 1.

Western Egg Rock Breakers buoy, St. George River, was changed from a red spar No. 2 to a black spar No. 1.

Other changes were made as follows:

Cranberry Point buoy, Lubec Narrows, was changed from a red spar No. 6 to a second-class nun buoy of the same color and number.

**First District.**

The Gin Bottle buoy, Lubec Narrows, was changed from a third-class can black No. 5 to a second-class can buoy of the same color and number.

Buckman Ledge buoy, Eastport Harbor, was changed from a red spar No. 2 to a second-class nun buoy of the same color and number.

Cummings Ledge buoy, Moosabec Reach, was changed from a red spar No. 12 to a second-class nun of the same color and number.

Gilchrist Rock buoy, Moosabec Reach, was changed from a red spar No. 12 to a second-class nun buoy of the same color and number.

Long Ledge buoy, Seguin Passage to Moosabec Reach, was moved 100 feet NNE. from the ledge and changed from a red spar No. 6 to a black spar buoy No. 3.

Fairway buoy, Burnt Coat Harbor, Swan Island, was changed from a second-class can, with black and white perpendicular stripes to an automatic bell buoy of the same color and marks.

Holbrook Ledge buoy, Linekins Bay, was moved 200 yards NNW. of the ledge and changed from a black spar No. 3 to a red spar buoy No. 4.

Third buoy, Lovejoy Narrows, Kennebec River, red spar, was moved NE. to about 50 yards SW. from the shoal part of the ledge.

Seventh buoy, third buoy in the Government Channel, Kennebec River, black spar, was moved about 60 yards to the SW. and named the sixth buoy, in place of one discontinued.

Staniford Ledge buoy, Portland Harbor, was changed from a first-class can, black with "S. L." in white letters, to a first-class bell buoy operated by electricity.

This electric bell buoy consists of a first-class bell buoy, the original bell being removed, equipped with a water-tight case, mounted in the upper part of the frame of the buoy, in which is an electric motor having a V-shaped electric magnet and an H-shaped armature.

The armature, about 2 inches in diameter, is wound with No. 24 silk-covered copper wire and the field magnet with No. 22 cotton-covered copper wire; the armature is connected in series with the field magnet.

The armature is mounted on a shaft that extends through the bottom of the inclosing case and serves to transmit the power of the armature to a striker that is placed outside the case and is arranged to strike on a 12-inch gong mounted vertically on the same frame that supports the case.

The buoy is connected with the Portland Breakwater light-station by a two-conductor Western Electric Company's armored cable, 1½ inches outside diameter, about 350 feet in length.

At the shore end is a battery composed of 18 cells of gravity battery, Western Union standard, in combination with 6 cells of storage battery. The gravity battery is constantly feeding its current into the storage, which is thereby kept charged.

**First District.**

A clockwork in a case mounted on the wall of the light-station has a contact piece attached to it by means of which the circuit is closed four times a minute through the cable and motor on the buoy, and each closure of circuit gives a stroke on the bell.

Goat Island Ledge buoy, Portsmouth Harbor, New Hampshire, was changed from a black spar No. 9 to a second-class can buoy of the same color and number.

The following-named buoys were lost during the year: Old Anthony whistling buoy, December, 1894, and in January, 1895, the Fairway buoy, first-class can, Portland Harbor.

**DEPOTS.**

*Little Diamond Island, Portland Harbor, Maine.*—The wharf, coal shed, and buildings are in good condition. The section of the wharf near the coal shed needs new plank and the upper end of the wharf needs repair. Material therefor was purchased. A brick oil house for the storage of kerosene oil was built.

*Bear Island, Mount Desert Island, Maine.*—The wharf, coal shed, and buildings are in good condition. Material was purchased for repairing the wharf and wheeling stage.

*Whitehead, West Penobscot Bay, Maine.*—The wharf and coal shed are in good condition. Minor repairs to the shed and wharf, including new fenders, are needed.

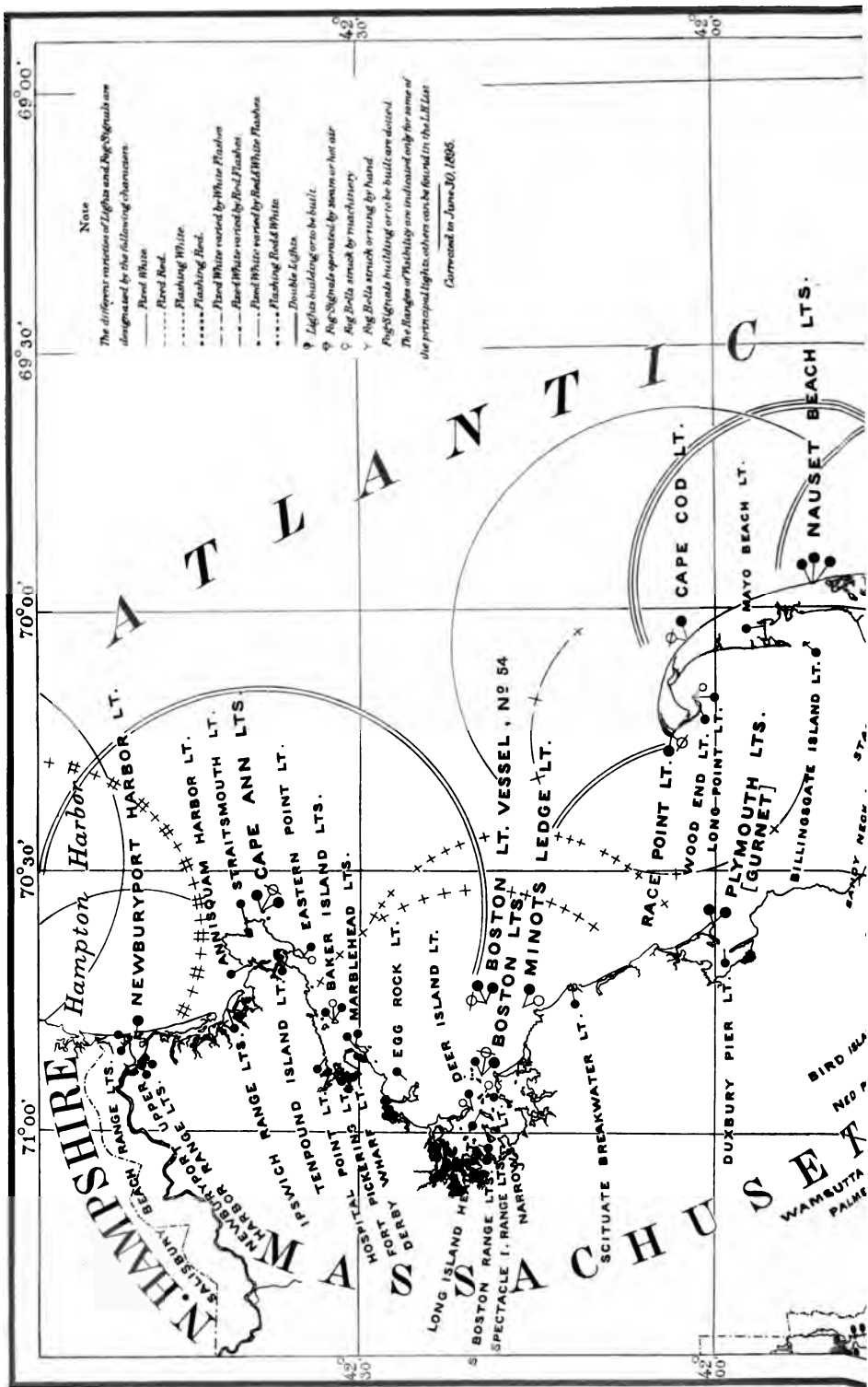
**TENDERS.**

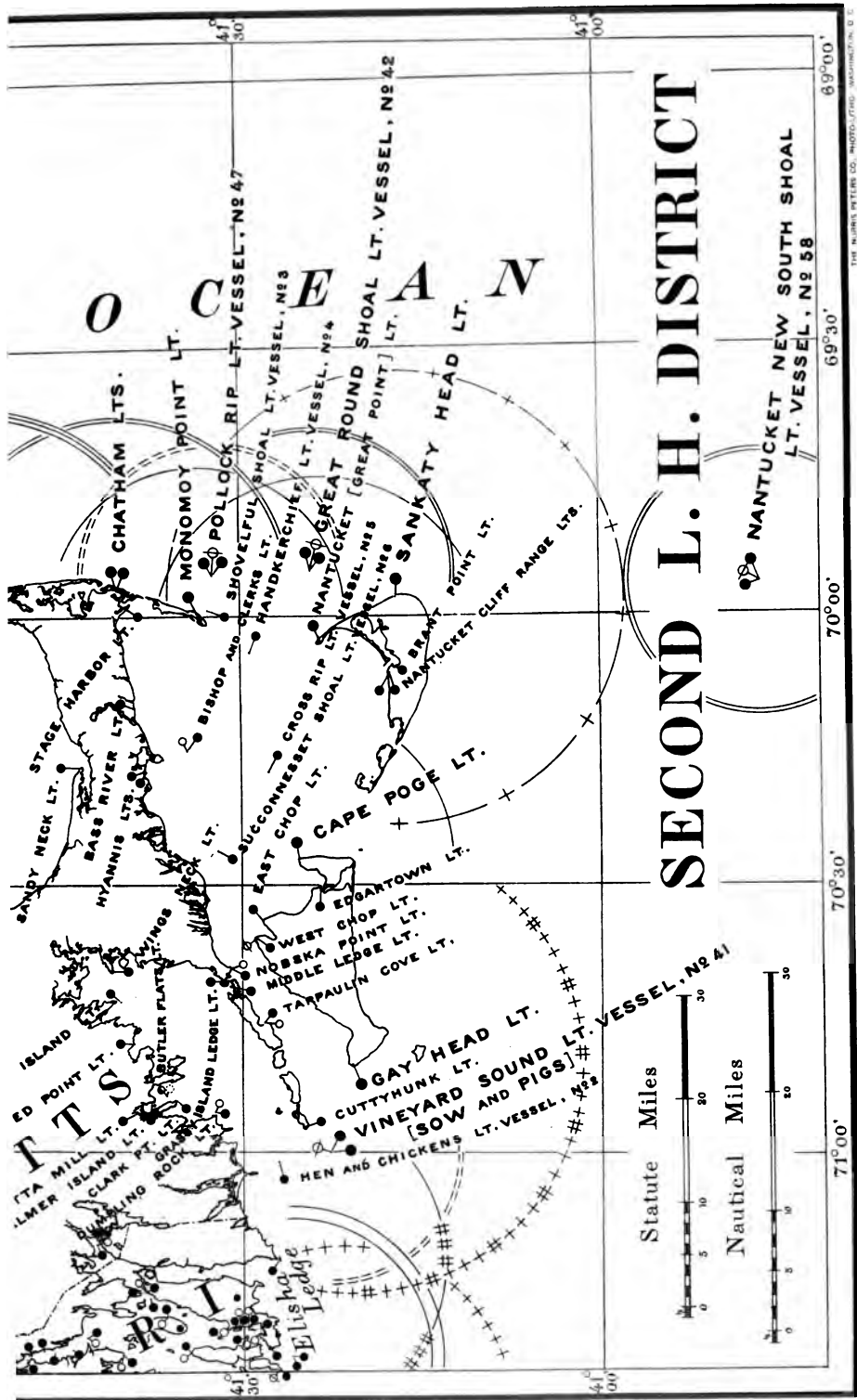
*The Lilac.*—This steel screw steamer was usefully and economically employed during the year. She was hauled out on the marine railway in November, 1894, and in June, 1895, when her bottom was cleaned and painted. Minor repairs were made to the engine and hull. In November, 1894, a new false keel and shoe were fitted, and in February, 1895, a steam capstan windlass was installed. A new forecastle deck was built and the engine and hull were repaired. She is now in excellent condition. This district is growing so fast that two tenders are needed to properly perform the work. With one tender it is difficult to change, replace, paint, and keep in order the 664 buoys and 103 beacons, spindles, and tripods. Another tender is urgently needed for the other portion of the district work, such as supply and inspection of light-stations, the examination of ground for buoyage, the rapid replacing and repair of buoys, which are constantly going adrift, or of bell or whistling buoys, which are often out of order.

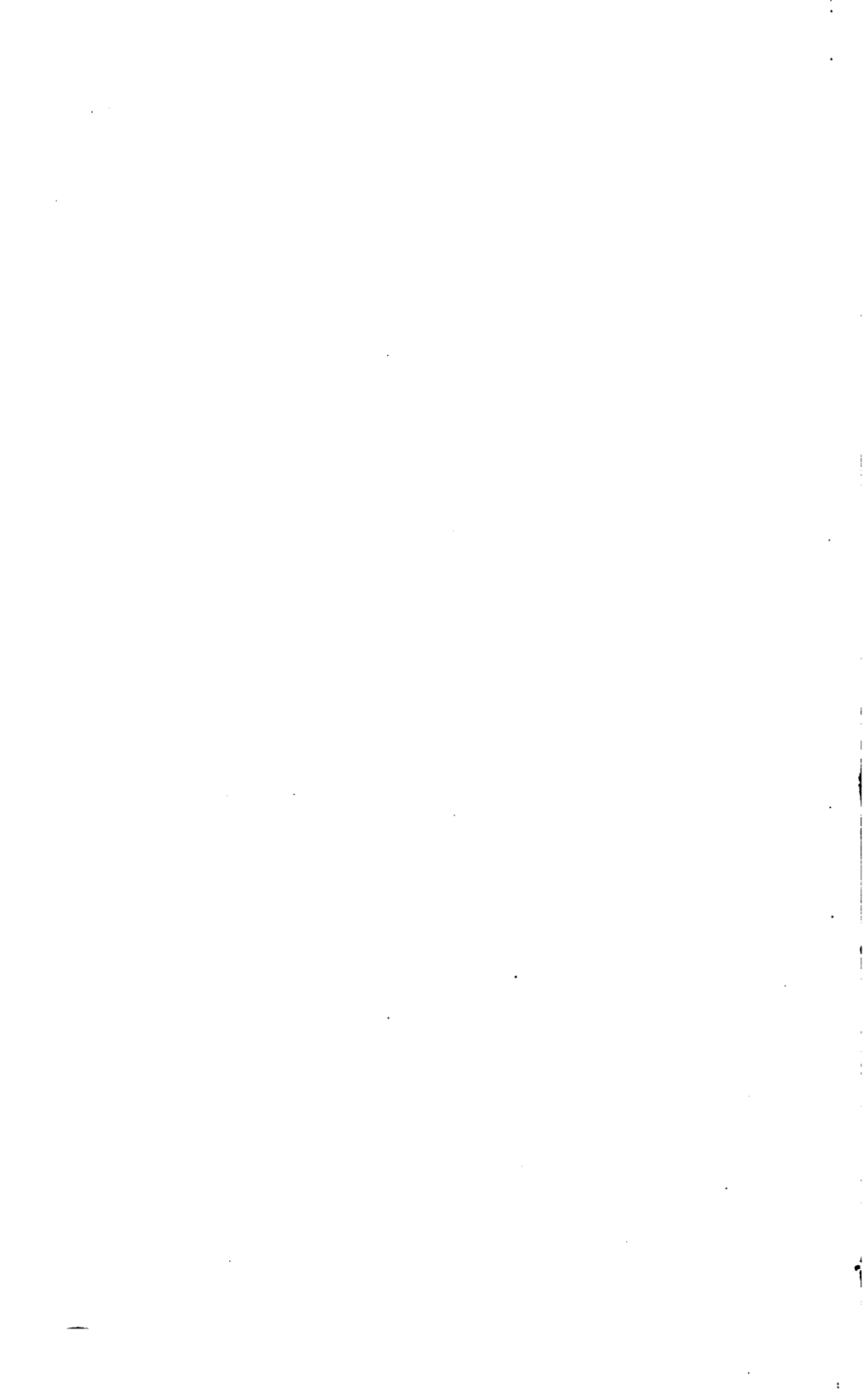
The *Lilac* was employed during the fiscal year as follows:

She was laid up for repairs 21 days, the cost of which was \$4,575.66. She steamed 16,800 miles, in doing which she consumed 891 tons of coal. She replaced 128 buoys, changed 251 buoys, painted 715 buoys, painted 23 spindles, made 44 buoys, landed at light-stations 157 tons of coal, and did 28 days' work at the buoy depot.











## SECOND DISTRICT.

This district extends from Hampton Harbor, New Hampshire, to Elisha Ledge, off Warren Point, Rhode Island, but does not include either the harbor or the ledge. It embraces all aids to navigation on the seacoast and tide waters of Massachusetts excepting those on the Taunton River and that part of Mount Hope Bay lying within the State boundary.

*Inspector.*—Commander Francis M. Green, United States Navy.

*Engineer.*—Maj. William R. Livermore, Corps of Engineers, United States Army.

In this district there are—

Light-houses and lighted beacons .....	74
Light-ships in position .....	10
Light-ship for relief .....	1
Day or unlighted beacons .....	73
Fog signals operated by steam or hot-air engines .....	10
Fog signals operated by clockwork .....	10
Lighted buoys in position (gas) .....	4
Whistling buoys in position .....	12
Bell buoys in position .....	15
Other buoys in position .....	510
Ice buoys for winter use .....	12
Steamers <i>Verbena</i> , <i>Geranium</i> , and <i>Azalea</i> , buoy tenders and for supply and inspection .....	3
Steamer <i>Myrtle</i> , for construction and repair in the First and Second districts .....	1

## LIGHT-STATIONS.

68, 69. *Salisbury Beach, mouth of Merrimac River, Massachusetts.*—The light-posts were moved three times on account of the washing away of the bank and change in the channel.

73, 74. *Ipswich, mouth of Ipswich River, Massachusetts.*—The walks between the dwelling, tower, and beacon house were rebuilt. Various repairs were made.

77, 78. *Cape Ann, Thatcher Island, Massachusetts.*—Extensive repairs were made to the cistern in the fog-signal house. Pipes were laid to the sea to provide water in case of drought. A cellar was made under the brick house and a storm porch was put over the back door. A hoisting engine was purchased. Various repairs were made.

84. *Fort Pickering, Winter Island, entrance to Salem Harbor, Massachusetts.*—Water pipes were laid to connect the dwelling with the Salem

**Second District.**

water system. Materials for repairing the footbridge and walks were purchased and landed at the station.

86, 87. *Marblehead, Massachusetts.*—A contract was made for rebuilding the tower. The old tower was demolished and a temporary wooden tower was erected for use while rebuilding the tower. Minor repairs were made.

88. *Egg Rock, off Nahant, Massachusetts.*—A landing derrick was set up, and repairs were made to the barn and stairs.

90. *Minots Ledge, entrance to Boston Bay, Massachusetts.*—The lower section of the landing ladder was renewed, and the fog-signal machinery was overhauled and repaired. Extensive repairs were made to the dwellings and outbuildings of the shore station at Cohasset.

91, 92. *Boston, on Little Brewster Island, entrance to Boston Harbor, Massachusetts.*—Thirty new fender piles were put on the sides of the wharves, and part of the timbers and planking were renewed. About 200 tons of riprap were hauled into place on the north side of the wharf. Various repairs were made.

— *Spectacle Island range lights, Boston Harbor, Massachusetts.*—An appropriation of \$9,350 was made by the act approved March 2, 1895, for establishing range lights on this island. The proper measures are being taken for carrying this appropriation into effect.

96, 97. *South Boston range lights, Massachusetts.*—An appropriation of \$1,000 was made by the act approved August 18, 1894, for establishing range lights at or near Marine Park Pier and City Point, Boston Harbor. These range lights were duly established, and on April 15, 1895, were lighted for the first time.

105. *Mayo Beach, at the head of Wellfleet Harbor, Cape Cod, Massachusetts.*—Some 50 loads of loam were placed around the dwelling to keep it from being undermined. Minor repairs were made.

109, 110, 111. *Nauset Beach, three towers at Eastham, Cape Cod, Massachusetts.*—Some 1,400 feet of boundary fence were rebuilt, a storm porch was placed at the door of each tower, and minor repairs were made.

123. *Brant Point, entrance to Nantucket Harbor, Massachusetts.*—A new lantern and deck were put in the tower. Various repairs were made.

134. *Edgartown, Vineyard Sound, Massachusetts.*—A well was driven, and minor repairs were made.

135. *East Chop, entrance to Vineyard Haven, Massachusetts.*—A storm porch was put over the tower door, and minor repairs were made.

136. *West Chop, entrance to Vineyard Haven, Massachusetts.*—An oil house was built. The fog-signal machinery was overhauled and extensively repaired. The boundary fence was rebuilt, and minor repairs were made.

### Second District.

138. *Grassy Island Ledge beacon, on the south end of the ledge, westerly entrance to Great Harbor, Woods Hole, Massachusetts.*—A beacon light was established here on March 31, 1895, and paid for from the general appropriation for repairs, etc., of light-houses, which provides for establishing pierhead and other beacon lights, in the act approved August 18, 1894.

139. *Middle Ledge beacon, at the west end of the ledge in the channel through Woods Hole, from Vineyard Sound into Buzzards Bay, Massachusetts.*—A beacon light was established here on March 31, 1895, and paid for from the general appropriation for repairs, etc., of light-houses, which provides for establishing pierhead and other beacon lights, in the act approved August 18, 1894.

150. *Bird Island, entrance to Sippican Harbor, Buzzards Bay, Massachusetts.*—Some 150 feet of close board fence were rebuilt. Various repairs were made.

— *Butler Flat, New Bedford Harbor, Massachusetts.*—An appropriation of \$45,000 was made by the act approved March 2, 1895, for establishing a light and fog signal on or near Butler Flat, entrance to the lower harbor of New Bedford, to take the place of Clark Point and Fairhaven bridge lights. The proper measures are being taken for carrying this appropriation into effect.

### REPAIRS.

At each of the stations named below repairs, more or less extensive, were made during the year:

70. Newburyport Harbor, Mass.	99, 100. Plymouth (Gurnet), Mass.
71. Newburyport upper harbor, outer beacon, Mass.	102. Race Point, Mass.
72. Newburyport upper harbor, inner beacon, Mass.	106. Billingsgate Island, Mass.
75. Annisquam Harbor, Mass.	107. Sandy Neck, Mass.
76. Straitsmouth, Mass.	108. Cape Cod, Mass.
79. Eastern Point, Mass.	120. Sankaty Head, Mass.
80. Tenpound Island, Mass.	122. Gay Head, Mass.
81, 82. Baker Island, Mass.	128. Bishop and Clerks, Mass.
83. Hospital Point, Mass.	129, 130. Hyannis, Mass.
85. Derby Wharf, Mass.	133. Cape Poge, Mass.
93. Narrows, Mass.	137. Nobska Point, Mass.
94. Deer Island, Mass.	140. Tarpaulin Cove, Mass.
95. Long Island Head, Mass.	143. Cuttyhunk, Mass.
98. Scituate Breakwater, Mass.	144. Dumpling Rock, Mass.
	145. Clark Point, Mass.
	146. Palmer Island, Mass.

### LIGHT-VESSELS.

89. *Boston light-vessel, No. 54, entrance to Boston Harbor, Massachusetts.*—This vessel was taken from Nantucket New South Shoal station on September 15, 1894, and brought to New Bedford, where she was hauled out on the ways, and her bottom scraped and painted. On

**Second District.**

October 1 she was placed on this new station, where she has since remained. This vessel has added materially to the safety of navigation in Massachusetts Bay. Vessel owners and masters have been unanimous in their testimony to her great value in entering Boston Harbor in thick weather. She was furnished with patent log, galley ware, engineer stores, and bed linen.

By the act approved August 18, 1894, an appropriation of \$35,000 was made to begin a light vessel for this station, and authority was given to contract therefor to an amount not exceeding \$70,000. By the act approved March 2, 1895, the additional \$35,000 needed was appropriated and made immediately available. Plans and specifications for the vessel were then made, and she was put under contract to be finished in the early spring of 1896.

114. *Pollock Rip light-vessel, No. 47, off Chatham, Cape Cod, Massachusetts.*—This vessel remained on her station during the entire year. She received engineer stores, boat mast, grate bars, lantern glass, new springs for riding stopper, and new whistle valve, and her lamp reflectors were resilvered.

116. *Shovelful Shoal light-vessel, No. 3, off Monomoy Point, Cape Cod, Massachusetts.*—This vessel remained on her station during the year. She was supplied with galley ware. No repairs were made.

117. *Handkerchief light-vessel, No. 4, Nantucket Sound, Massachusetts.*—This vessel remained on her station during the entire year. She was supplied with galley ware, and her medicine chest was replenished.

118. *Great Round Shoal light-vessel, No. 42, off Nantucket, Massachusetts.*—This vessel remained on her station during the year. She was supplied with engineer stores, bed linen, tube rods, and stove linings.

121. *Nantucket New South Shoal light-vessel, No. 58, about 30 miles south of Nantucket, Massachusetts.*—New light-ship, No. 58, was placed on this station September 15, 1894, relieving light-vessel No. 54, which was put on the Boston station. On February 1, in clearing chain, she parted her moorings, losing her mushroom anchor. She was replaced on her station on February 3, where she has since remained. When this vessel was received from the contractors she was found not to comply with the specifications in many important particulars. As the ship was urgently needed for service some of these discrepancies were supplied, at the cost of the contractors, before the ship was placed on her station.

131. *Cross Rip light-vessel, No. 5, Nantucket Sound, Massachusetts.*—This vessel remained on her station the entire year. She was supplied with blankets, bed linen, dory, boat mast, and a new lightning rod. Slight repairs were made to the windlass and bell frame.

132. *Succonnesset Shoal light-vessel, No. 6, Nantucket Sound, Massachusetts.*—This vessel remained on her station during the entire year.

**Second District.**

141. *Vineyard Sound light-vessel, No. 41, western entrance to Vineyard Sound, Massachusetts.*—This vessel remained on her station during the entire year. She was supplied with engineer stores and new springs for her riding stopper. Her boiler was patched while on the station, and her large boat was repaired.

142. *Hen and Chickens light-vessel, No. 2, entrance to Buzzards Bay, Massachusetts.*—This vessel remained on her station during the entire year. She was supplied with galley ware, bedding, new sails, and a large boat.

— *Relief light-ship, No. 9.*—This vessel was towed to the Fourth light-house district on January 6, and placed for temporary duty on Winter-Quarter Shoal, where she still remains.

— *Relief light-vessel, No. 39.*—This vessel was on no station during the year, but remained in readiness for use at Woods Hole buoy depot. During the year her deck was calked by the carpenter of the tender *Geranium*.

**DAY OR UNLIGHTED BEACONS.**

Many of the beacons in the district were painted by the crews of light-house tenders.

*Newburyport Harbor, Massachusetts, north and south piers.*—Extensive repairs were made and the day marks were renewed.

*White Rocks beacon, Lynn Harbor, Massachusetts.*—A dolphin was erected.

*Black Rocks beacon, Lynn Harbor, Massachusetts.*—A dolphin was erected.

*Sandy Point beacon, Lynn Harbor, Massachusetts.*—A dolphin was erected.

*Bird Island, Boston Harbor, Massachusetts.*—About 100 tons of riprap were replaced around the spindle.

*False Spit, Boston Harbor, Massachusetts.*—The day mark was repaired and the riprap replaced around the spindle.

*North beacon, Scituate Harbor, Massachusetts.*—The beacon was renewed.

*Point Neck Rock, Essex River, Massachusetts.*—The spindle was reset.

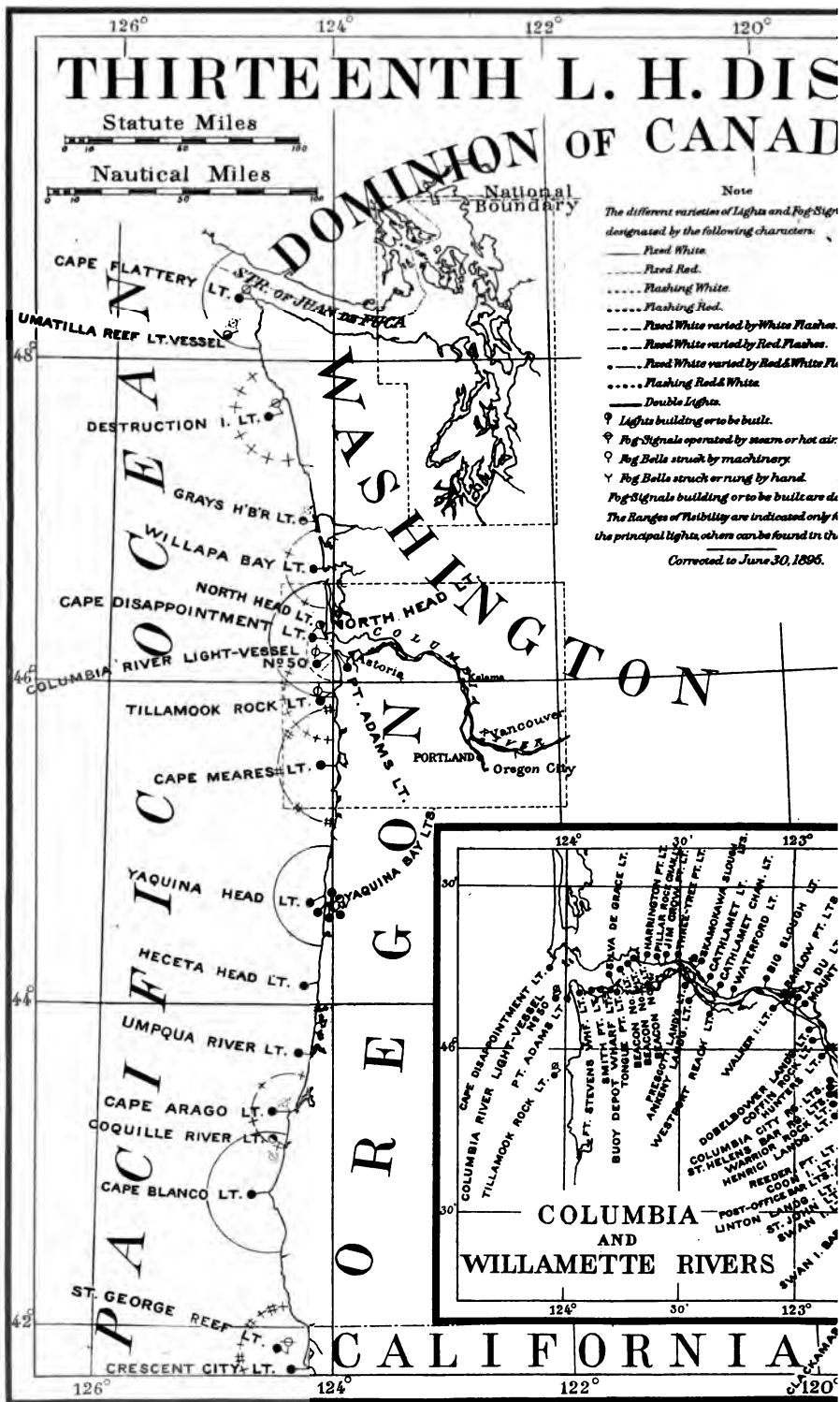
*Cormorant Rock, Buzzards Bay, Massachusetts.*—The spindle was reset.

**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

77, 78. *Cape Ann, Massachusetts.*—This 10-inch steam whistle was in operation some 692 hours, and consumed about 41 tons of coal.

89. *Boston light-vessel, No. 54, Massachusetts.*—This 12-inch steam chime whistle was in operation some 556 hours, and consumed about 121 tons of coal. It was established on October 1, 1894.

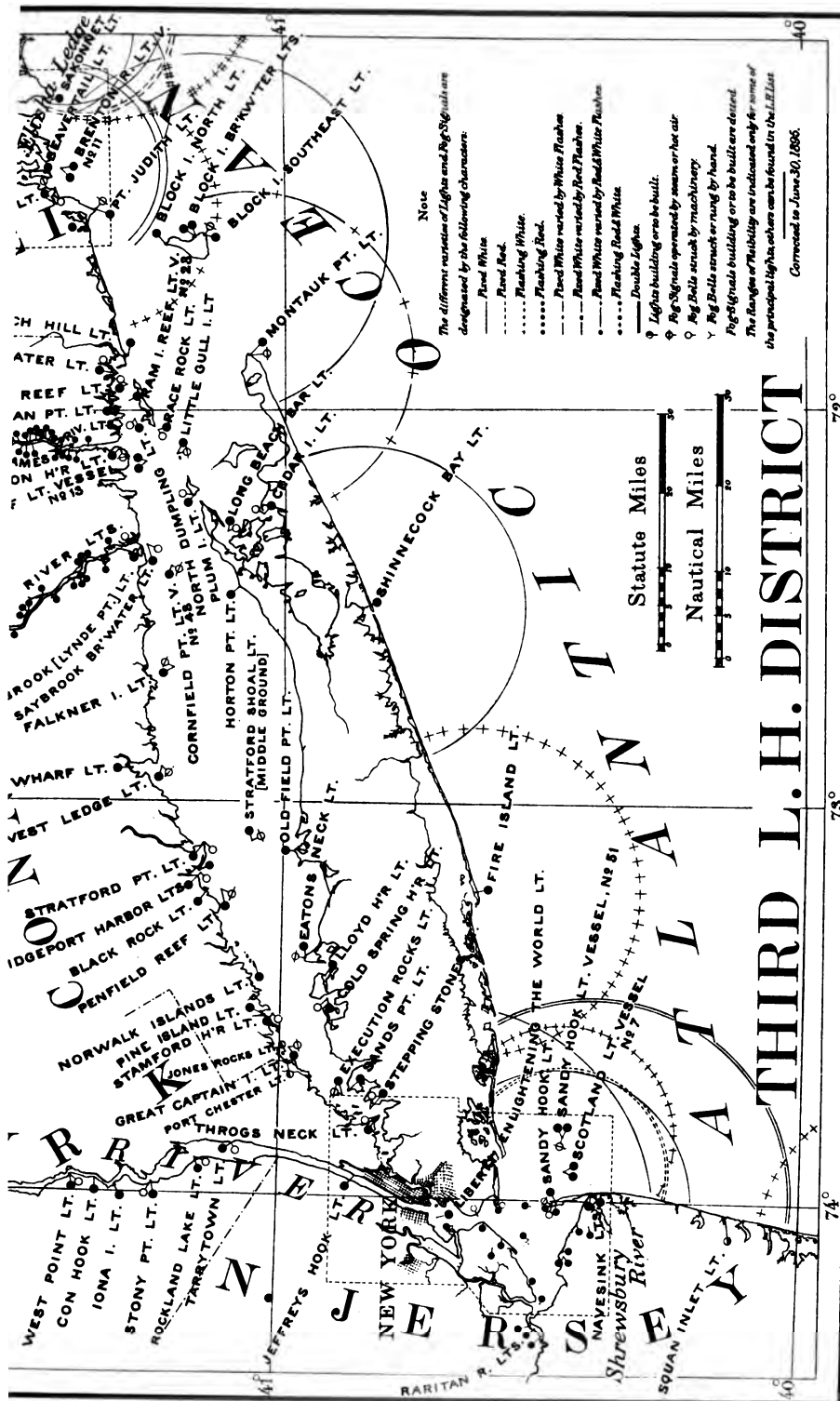
91. *Boston, Massachusetts.*—This first-class steam siren was in operation some 925 hours, and consumed about 70 tons of coal.

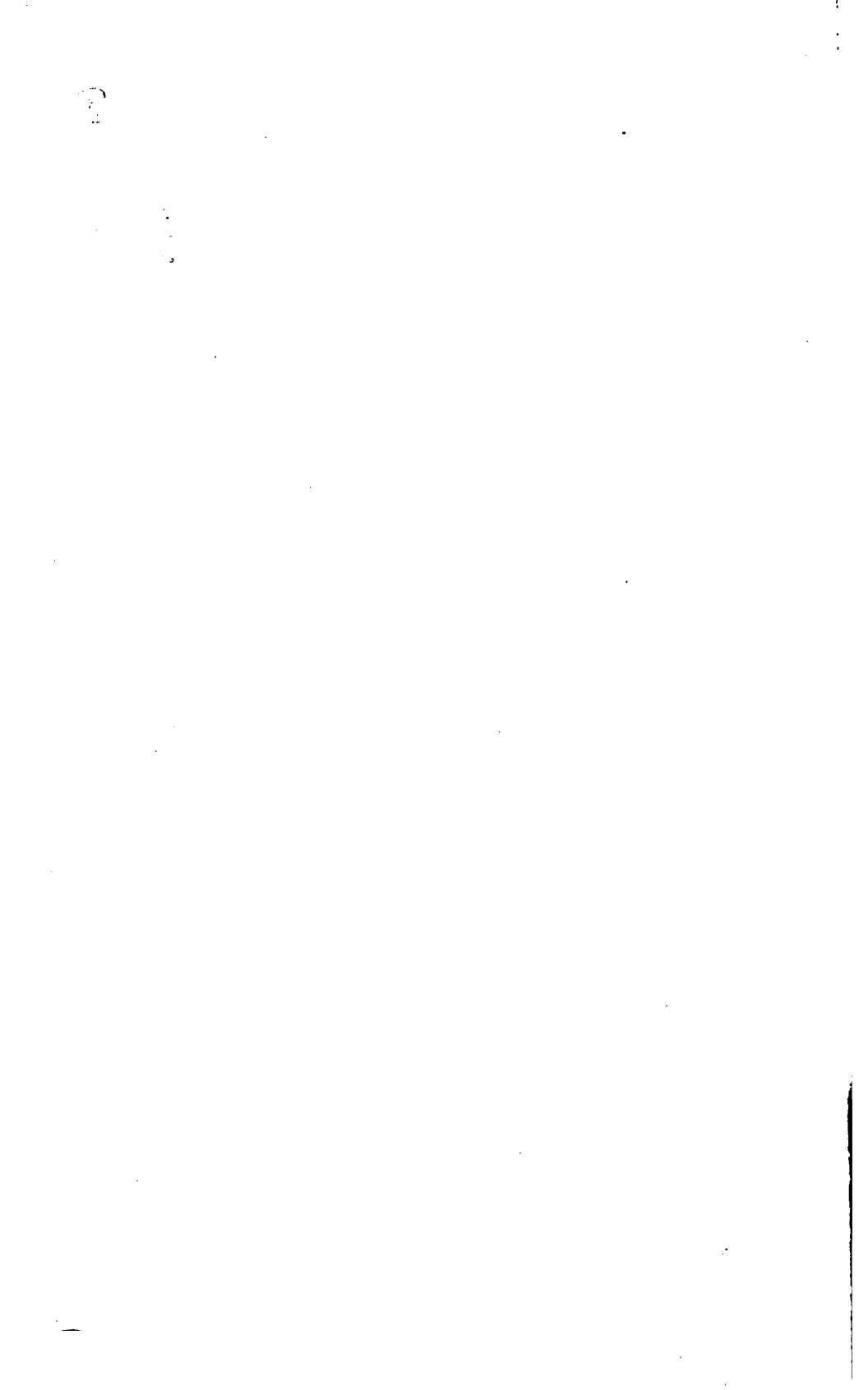












## THIRD DISTRICT.

This district extends from Elisha Ledge, off Warren Point, Rhode Island, to a point on the coast of New Jersey opposite Shrewsbury Rocks, and includes the ledge and the rocks. It embraces all aids to navigation on the coasts of Rhode Island, Connecticut, and New York, and of New Jersey northward of the point opposite Shrewsbury Rocks, and on all tidal waters tributary to the sea or Long Island Sound between the limits named, together with the aids on Whitehall Narrows and on the United States waters of Lakes Champlain and Memphremagog.

*Inspector*.—Capt. Winfield S. Schley, United States Navy, to March 1, 1895; since then, Commander A. S. Snow, United States Navy.

*Engineer*.—Maj. David P. Heap, Corps of Engineers, United States Army, to November 1, 1894; Lieut. Col. Peter C. Hains, Corps of Engineers, United States Army, to May 22, 1895; since then, First Lieut. William E. Craighill, Corps of Engineers, United States Army.

There are in this district—

Light-houses and beacon lights, including 98 post lights.....	241
Light-ships in position.....	7
Light-ships for relief.....	3
Day or unlighted beacons.....	40
Fog signals operated by steam or hot-air engines.....	16
Fog signals operated by clockwork.....	50
Electric buoys (new system).....	11
Gas-lighted buoys.....	3
Whistling buoys in position.....	5
Bell buoys in position.....	22
Other buoys in position.....	576
Steamer <i>Armeria</i> , used for supplying the light-stations of the Atlantic and Gulf coasts.....	1
Steamers <i>John Rodgers</i> and <i>Cactus</i> , buoy tenders, and for supply, inspection of light-stations, and for repair of the cable, etc., of the electric-lighted buoys..	2
Steamer <i>Gardenia</i> , buoy tender and for freight.....	1
Steamers <i>Mistletoe</i> and <i>Rose</i> , used for works of construction and repair of light-stations, fog signals, and day beacons.....	2
Steamer <i>Nettle</i> , for works of construction and repair on Lake Champlain.....	1
Steam launch <i>Daisy</i> , used to keep the Gedney Channel electric-lighted buoys in repair.....	1

## LIGHT-STATIONS.

— *Plum Beach, Narragansett Bay, Rhode Island*.—By the act approved March 2, 1895, an appropriation of \$20,000 was made for establishing a light and fog-signal station at this point, and a contract therefor was authorized, not to exceed \$60,000. The site has been

**Third District.**

selected and surveyed, and preliminary plans have been made. It is now recommended that the balance of the estimate, \$40,000, be appropriated for continuing and finishing this work.

161. *Gull Rocks, Narragansett Bay, Rhode Island.*—The walks, platforms, and steps, which had been carried away by storms, were rebuilt.

165. *Prudence Island, Narragansett Bay, Rhode Island.*—A new boat-house and ways were built. Minor repairs were made.

166. *Hog Island Shoal light-house, Narragansett Bay, Rhode Island.*—The Board is of opinion that the light-vessel of this name should be replaced by a light-house. It is estimated that it can be built for, say, \$35,000. It is recommended that an appropriation of this amount be made therefor.

172. *Bullock Point, Providence River, Rhode Island.*—A platform was built. Contract was made for placing 200 tons of riprap stone around the station.

178. *Point Judith, entrance to Narragansett Bay, Rhode Island.*—A 30,000-gallon cistern was built and connections were made. Various repairs were made.

185. *Stonington Breakwater, Long Island Sound, Connecticut.*—The sleeping quarters for the light-keeper on the breakwater were secured to its stonework, and new landing steps were built. Contract was made for delivering and so placing riprap as to protect the light-house pier.

210. *Race Rock, off Fishers Island, Long Island Sound, New York.*—This light-station, which was built at large expense, is of great use to vessels going in and out of Long Island Sound. It would be of much greater use if it had a fog signal. There is deep water close to this rock. The current running by it is so swift that the channel is called "The Race." Hence the light-station, when it is hidden by fog, day or night, is a source of great anxiety to navigators if not a positive danger. A fog signal could be established here at a cost not to exceed \$3,000, and it is recommended that an appropriation of this amount be made therefor.

211. *Little Gull Island, Long Island Sound, New York.*—Contract was made for rebuilding the landing wharf. Various repairs were made.

212. *Plum Island, Long Island Sound, New York.*—A new fog-bell tower was built. Contract was made for rebuilding the landing wharf. Minor repairs were made.

215. *Saybrook Breakwater, Long Island Sound, Connecticut.*—A small oil house and new landing steps were built. Some 500 tons of riprap were placed around the pier, and a contract was made for 500 tons more. Various repairs were made.

252. *Falkner Island, Long Island Sound, Connecticut.*—Extensive repairs were made to the dwelling. Contract was made for rebuilding the breakwater on the north side of the boat landing.

253. *Southwest Ledge, entrance to New Haven Harbor, Connecticut.*—An appropriation of \$3,000 was made by the act approved March 2,

**Third District.**

1895, for establishing a fog signal here. Proper measures are being taken therefor. Some large stones were removed from the front of the boat landing and some minor repairs were made.

255. *Stratford Point, Long Island Sound, Connecticut.*—An oil house was built. Various repairs were made.

256. *Stratford Shoal (Middle Ground), Long Island Sound, New York.*—Riprap was placed for the protection of the pier and a contract was made for furnishing and placing 600 tons more of riprap. Stones were removed from the front of the boat landing. Various repairs were made.

Complaint is made that the fog signal is not powerful enough. It is a second-class Daboll trumpet. If fitted with a Ryder engine and a Clayton air compressor it might do as well as Penfield Reef, which is so fitted, and is successful.

259. *Bridgeport Breakwater, Long Island Sound, Connecticut.*—Under an appropriation of \$2,500 made by the act approved August 18, 1894, the tower was completed, and about March 1, 1895, the lantern light was removed, and a lens lantern was established in the tower in its place. Material was prepared and furnished for the boat landing.

267. *Pine Island beacon, Long Island Sound, Connecticut.*—This beacon light, displayed from a red lantern, was established. It was lighted on January 19, 1895, for the first time.

269. *Execution Rocks, Long Island Sound, New York.*—The work of putting a new foundation under the southwest wall of the dwelling was finished, the wall was replaced, and the repairs and alterations were completed. Various repairs were made.

270. *Sands Point, Long Island Sound, New York.*—This light was discontinued on October 31, 1894, as being no longer needed, but it was reestablished January 21, 1895, at the urgent and persistent request of mariners.

271. *Stepping Stones, Long Island Sound, New York.*—Some 300 tons of riprap stone were placed for the protection of the pier.

281. *Hell Gate post light, East River, New York.*—The tower was rebuilt, and a new foundation was built under the northwest corner.

284. *Fire Island, seacoast of New York.*—The ceiling and walls of the dwelling were repaired and patched. The watch-room deck was pointed and grouted. The following-named work, preparatory to establishing the new electric light, was completed: A power house and coal shed were built. Two boilers, one engine, one dynamo, and one exciter were put in place. A narrow-gauge railroad was built from the beach to the coal shed. All the ironwork necessary to adapt the lantern to the new apparatus was fitted, and is now stored at the general light-house depot ready for shipment. A fourth-order lantern was placed temporarily on a bracket on the south side of the tower to be used while the new light is being installed.

**Third District.**

297. *North Hook Beacon, New York Bay, New Jersey.*—A frame tower was built on the north side. Various repairs were made.

298. *Sandy Hook fog bell, New York Bay, New Jersey.*—The tower was moved 120 feet south and placed on a new foundation.

301. *Conover beacon (front), New York Bay, New Jersey.*—An oil house was built. Various repairs were made.

302. *Chapel Hill beacon (rear), New York Bay, New Jersey.*—An oil house was built.

303. *Point Comfort beacon (front), New York Bay, New Jersey.*—An oil house was built. Contract was made for building jetties for the protection of the reservation.

304. *Waackaack (rear), New York Bay, New Jersey.*—The tower was completed, and the apparatus for the two ranges was installed, and on October 25, 1894, was put into operation. An oil house was built. The first-order lamps were on April 18, 1895, replaced by third-order lamps. Various repairs were made.

315. *Fort Tompkins, on Staten Island, New York.*—The following recommendation, made in the Board's last three annual reports, is renewed:

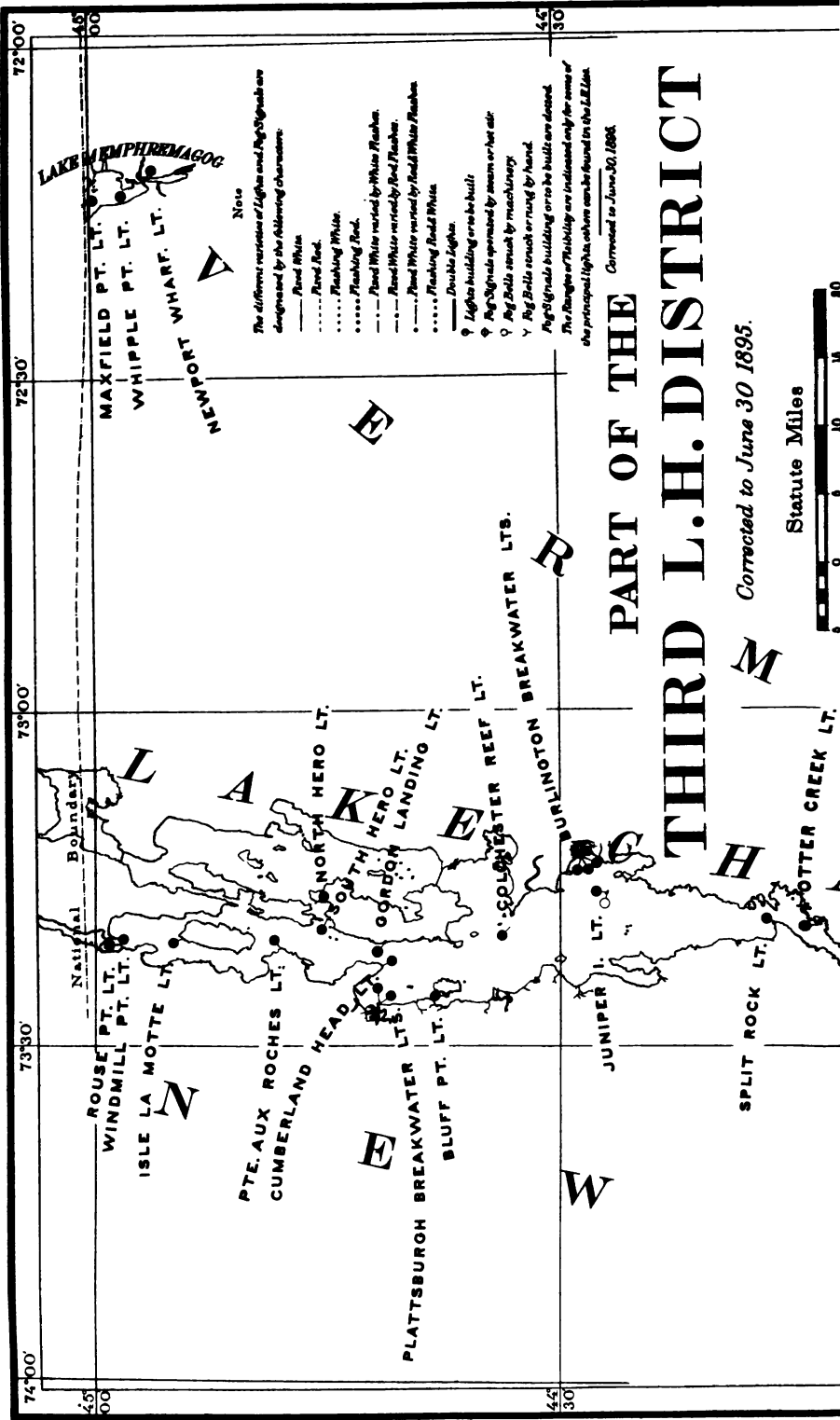
The light at Fort Tompkins at present is well back of the point it is intended to mark. It is therefore proposed to remove it from there to an angle of the stone fort at Fort Wadsworth, where it will better serve as a mark to the channel leading directly into New York Harbor. A fog signal at Fort Wadsworth would be of especial service to the large commerce going through the Narrows during thick weather. The fog bell at Fort Lafayette is serviceable to vessels bound to Coney Island, but it is too distant to be of much use to vessels using the other and more-frequented side of the channel. The change will make it necessary to build a lantern and watch room on the salient of the fort and to place a fog-signal house and apparatus at the foot of the wall. It is estimated that these changes can be made for not exceeding \$1,500, and it is recommended that an appropriation of this amount be made therefor.

A battery for five high-power modern rifles is about to be completed and armed directly in the rear of the light-house. This fact makes it more important than before that this light should be removed.

323. *Jeffreys Hook post light, New York.*—A larger light and a fog bell here would be valuable aids to navigation. The point extends well out into the river, with deep water close to its outer end. The usual route of steamers passing up or down the river is close to the point. The present post light should be replaced by a new structure, upon which should be the lantern with the bell below. It is estimated that these could be established on land to be acquired for the purpose for say \$3,000, and it is recommended that an appropriation of this amount be made therefor.

325. *Rockland Lake, Hudson River, New York.*—This work, which was done under contract, was finished September 12, 1894. The fog-signal apparatus was not included in the contract, but as soon as practicable this part of the work will also be finished. The station was lighted on October 1, 1894. A quantity of riprap was placed and an ice breaker was built to protect the pier.



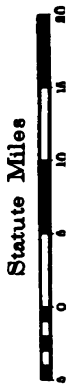


- Note*  
 The different varieties of Lights and Fog-Signals are designated by the following characters:  
 — Fixed White  
 — Fixed Red  
 ..... Flashing White  
 ..... Flashing Red  
 — Fixed White varied by White Flashes  
 — Fixed White varied by Red Flashes  
 ..... Flashing White varied by Red White Flashes  
 ..... Flashing Red White  
 — Double Light  
 ☉ Light building or is to be built  
 ☉ Fog-Signals operated by steam or hot air  
 ☉ Fog-Signals actuated by machinery  
 Y Fog-Bells struck or rung by hand  
 ☉ Fog-Signals building or to be built are dashed  
 The danger of Flushing are indicated only for some of the principal lights where can be found in the L.H. List

Corrected to June 30, 1895.

# PART OF THE THIRD L.H. DISTRICT

Corrected to June 30 1895.





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BENJAMIN PLACE.

WILLIAM L. HALL

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**Third District.****LIGHT-VESSELS.**

153. *Brenton Reef light-vessel, No. 11, entrance to Narragansett Bay, Rhode Island.*—She received a new boat, sails, cooking utensils, lumber, fuel, and the like. She is kept in good order, but is in need of general repairs. Should have a compressed-air fog-signal plant worked by oil engines. Estimated cost, \$3,000.

166. *Hog Island Shoal light-vessel, No. 12, Narragansett Bay, Rhode Island.*—She is in need of general repairs, but is too old and too small to make it worth while to expend upon her more than will fit her for temporary service. She has received cooking utensils, stove fixtures, new fenders, paints, and cordage. She is kept in good order.

187. *Ram Island Reef light-vessel, No. 23, Fishers Island Sound, Long Island Sound, New York.*—She was placed here on December 8, 1894, relieving light-vessel No. 19, which is past service except for occasional use as a relief light-ship. On May 15, 1895, light-vessel No. 23 was taken off her station for repairs, and on June 14 was returned. During her absence the reef was marked by relief light-vessel No. 20. Light-vessel No. 23 received a new windlass and a surge reliever, new pump, chain pipe in the deck, and wedges in the mainmast, and her planking outside was thoroughly repaired. She is now in good condition and will need no further immediate repair. She received cooking utensils, paint, and ship chandlery. She is kept in good order.

209. *Bartlett Reef light-vessel, No. 13, off New London, Long Island Sound, Connecticut.*—She is in good condition and, barring accident, will need no large repairs during the current year. She received a new rail, a new companion way and skylight, her decks were recalced, the berth deck was patched, the oil rooms were changed, and new masts and wire rigging were put in. She was taken off her station for repairs on May 1, 1894, and on July 19 was returned. She was furnished with flags, medicines, paint, bedding, and ship chandlery. She is kept in good condition.

250. *Cornfield Point light-vessel, No. 48, off the mouth of the Connecticut River, Long Island Sound, Connecticut.*—Light-vessel No. 51 was removed from this station November 8, 1894, and was placed on the Sandy Hook station December 6, 1894. Relief ship No. 20 took her place until January 16, 1895, when light-vessel No. 48, transferred from Sandy Hook, was put permanently on this station. The characteristic of the light was changed from electric white, with eclipses, on light-vessel No. 51, to a flashing white on the foremast and fixed red on the mainmast of light-vessel No. 48. The latter vessel on January 26, 1895, received a new fog whistle. New tubes were put in the boiler of light-vessel No. 48, and the machinery was adjusted by the men on board. When the governor is repaired, her boiler and engine will be in good condition. She received rope, paint, valves, lumber, fuel, and rations. She is kept in good order.

**Third District.**

285. *Sandy Hook light-vessel, No. 51, off the entrance to New York Bay, New York.*—She has steam for self-propulsion, and shows an electric light. She was taken from Cornfield Point station on December 6, 1894, and was placed off Sandy Hook, relieving light-vessel No. 48, which was transferred to Cornfield Point. The lights shown by light-vessel No. 48 were a flashing red every 30 seconds from the foremast, and fixed red from the mainmast. The change from these to a fixed white electric light, shown from the mainmast, during periods of 12 seconds, separated by eclipses of 3 seconds' duration, was very marked and gave the special identity required at this important station. The characteristic of the light is now distinct from those of all the other lights in the vicinity, and it permitted a return to red lights on the Scotland light-ship, a color greatly desired by navigators. Light-vessel No. 51 was withdrawn from her station June 24, 1895, for repairs. These consist of new pipe connections in her engine department, repairs to her hull and joiner work, and cleaning and painting her steel bottom. She received electrical supplies, medicines, grate bars, paint, ship chandlery, steam fittings, fuel, rations, and the like. She is kept in excellent order.

The following is an abstract of the report made to the inspector of the Third light-house district by his assistant, Lieut. Commander C. H. West, United States Navy:

On December 6, 1894, light-vessel No. 51, the only light-vessel lighted by electricity, was transferred from her station off Cornfield Point, Long Island Sound, and placed on Sandy Hook station, off the entrance to New York Lower Bay. The advisability of this change is shown by the reports of the New York pilots, who state that coming from the eastward in one of the most rapid of the ocean steamers they now sight the electric light of Sandy Hook light-vessel from five to ten minutes after they have sighted the brilliant lights on the Highlands of Navesink.

Considering that the Navesink lights are visible  $22\frac{1}{2}$  miles, the sighting of Sandy Hook light-vessel so few minutes after them speaks well for the power and effectiveness of the electric light. Its conspicuity is increased by its flashes, which, as is well known, quickly attract the eye searching for a light on a dark horizon. This is in marked contrast with the feeble red rays of its former oil flash light. Upon the establishment of this electric-lighted vessel off Sandy Hook the characteristic of Scotland light-vessel was changed to two fixed red lights, that there might be a marked distinction in the colors of the lights of the two vessels.

The electrical outfit of light-vessel No. 51 remained in excellent operation throughout the year and without interruption of the display of the electric light. The consumption of coal by the steam fog whistle and dynamos was great, but unavoidable, as the ship's boilers for motive power are extravagant when used for the minor purposes of operating fog signal or the dynamo. The auxiliary boiler was found to be of so little use that it was removed to the general light-house depot in June, 1895.

It was feared, on account of her large consumption of coal, averaging some 30 tons a month, that there would be difficulty in filling her coal bunkers on Sandy Hook station; but by watching for favorable weather she was kept supplied throughout the extremely rigorous winter of 1894-95.

The steel hull of this vessel requires that she should be frequently docked and painted. This was done on November 8, 1894, and again on June 26, 1895, an interval

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of about eight months. In both cases she was found to be quite foul, and she was somewhat pitted at the water line.

*286. Scotland light-vessel, No. 7, off Sandy Hook, entrance to New York Bay, New York.*—She was taken off her station August 7, 1894, and was prepared, by changes and additions and the installation of instruments, for the reception and transmission of telephonic communication from her station to Sandy Hook. She was on August 31, 1894, returned to her station. During her absence relief ship No. 16 occupied her place. There were furnished to the vessel hose, rope, paints, medicines, blocks, and the like. She is kept in excellent order.

Experiments which were begun in July, 1894, with a view to laying a cable for telephonic connection between the Scotland light-vessel and the shore, were on February 23, 1895, successfully completed. The cable runs from the electric buoy station at Sandy Hook and ends within a few hundred feet of the moorings of the light-ship.

— *Relief light-vessel, No. 20.*—On November 8, 1894, she was placed on the Cornfield Point station and remained there until January 16, 1895, when light-vessel, No. 48 relieved her. Her stem was repaired, new masts were put in, and her decks were calked. She received new bulwarks aft, a new windlass and surge reliever, a trysail mast, and iron cleats for towing purposes. In addition, many small repairs were made. She is now in good condition and is kept at New London ready for service as a relief light-vessel. On November 17, 1894, while stationed at Cornfield Point, she broke adrift and put in to New London, Conn. She was returned to her station four days later. She received rope, blocks, paint, tools, and the like.

— *Relief light-vessel, No. 19.*—On December 8, 1894, she was permanently removed from her station at Ram Island Reef, Fishers Island Sound. She is now at the New London light-house depot ready for temporary service. Her timbers are rotten and she is so weak and worn in every part as to be unfit for economical repair.

— *Relief light-vessel, No. 16.*—She is kept at the general light-house depot, Staten Island, New York. She is equipped with apparatus for a flashing white light, has a steam fog signal, and is held in readiness to relieve light-ships, but especially Sandy Hook light-ship No. 51 and Cornfield Point light-ship No. 48. On August 7, 1894, she relieved Scotland light-ship No. 7, which was brought in to receive telephone apparatus, and remained there some three weeks. On June 24, 1895, she relieved, at Sandy Hook, light-ship No. 51, which was brought in for repairs. She received during the year paint, tools, and ship chandlery.

— *Light-vessel off Fire Island, Atlantic coast of Long Island, New York.*—The principal ocean and coast steamship owners, agents, masters, pilots, and underwriters have petitioned the Light-House Board to

### Third District.

establish a light-ship with a powerful fog signal in place of the whistling buoy some 6 miles off Fire Island, giving therefor, in effect, the following reasons:

All incoming transatlantic steamers and vessels at present lay their course from, say, 10 to 15 miles south of Nantucket light-ship to Sandy Hook light-ship, passing Fire Island as close as possible in clear weather, that they may be reported from the signal station at that point.

In thick or foggy weather, or during the prevalence of snowstorms, when Fire Island light is not visible, commanders have to rely entirely upon the soundings, which, however, in the neighborhood of the entrance to the port of New York merely indicate the proximity of the land, but do not indicate the ship's location. Any vessel having overrun her distance may thus approach the dangerous New Jersey coast, where soundings are unreliable.

The whistling buoy now off Fire Island can be seen only for a limited distance. In foggy weather, or at night when there is but little sea on, its sound is seldom heard by passing vessels.

At present there is no fog signal at Fire Island light-house, but if there was there is question as to whether it could be heard distinctly with easterly, southeasterly, southwesterly, or southerly winds, when fog prevails. A light-vessel in this locality would fully meet the requirements of commerce, both in clear and thick weather.

Incoming transatlantic vessels endeavor to keep at least in 20-fathom soundings off the Long Island shore. They would therefore come within the sound of a fog siren on a light-vessel placed, say, within 6 or 8 miles of the Fire Island light-house. When they pick up this sound they could shape their course for Sandy Hook light-vessel or the entrance to the port.

The necessity for increased security, such as would be given by a light-vessel placed in this locality, is great. The value of the regular transatlantic steamers passing this point bound for New York every week is about \$13,000,000. The number of transient steamers and sailing vessels which go by Fire Island is enormous.

The number of incoming passengers passing Fire Island from the north of Europe every year averages 450,000, and the value of cargoes carried by these steamers represents annually many millions of dollars.

The principal value to navigation of a light-vessel off Fire Island would be its fog signal, which could be heard when neither the light of the light-house nor of the light-vessel could be seen.

It is estimated that the establishment of a light-vessel with all the modern improvements, in place of the whistling buoy now off Fire Island, would cost not exceeding \$80,000, and it is recommended that an appropriation of this amount be made therefor.

**Third District.****DAY OR UNLIGHTED BEACONS.**

All the day beacons in the district were painted during the year.

*Rose Island, south, Narragansett Bay, Rhode Island.*—A spindle and cage. The spindle is bent and the cage is missing. Repairs will be made.

*Halfway Rock, Narragansett Bay, Rhode Island.*—A spindle and square cage. The cage was carried away and will be replaced.

*Goat Island Shoal dolphin, Newport Harbor, Rhode Island.*—A clump of five piles. An incandescent electric light is maintained on this beacon by the Old Colony Steamboat Company.

*Pomham beacon, Providence River, Rhode Island.*—A stone tower, surmounted by a black ball. The ball is gone and will be replaced.

*Castle Island beacon, Bristol Harbor, Rhode Island.*—A stone tower, surmounted by a red ball. The ball was carried away and will be replaced.

*Sugar Reef, Fishers Island Sound, New York.*—An iron spindle, with a conical cage. The cage is gone and will be replaced.

*East Spindle, Fishers Island Sound, New York.*—An iron spindle with a cask. The spindle is bent and the cask has disappeared. They will be repaired.

*Wicopesset Rock, Lords Passage, Fishers Island Sound, New York.*—An iron spindle with a cask. The spindle is bent and the cask is gone. Repairs will be made.

*Potter (or Seaflower) Reef beacon, Fishers Island Sound, Connecticut.*—A square granite structure, surmounted by an iron spindle and cage. The whole beacon is so dilapidated that it will have to be rebuilt.

*Success Rock beacon, near Sands Point, New York.*—An iron spindle fitted in the rock. The spindle is out of plumb; otherwise it is in good condition.

*Oyster Pond Reef, on the eastern rock, off Orient Point, Long Island, New York.*—A cast-iron cylinder, filled with concrete, surmounted by an iron shaft and square cage. This beacon was ruined last winter and will be rebuilt. The material is at the depot ready for shipment.

*Old beacon, Passaic River, New Jersey.*—A wooden beacon, with one red and two black bands, on a granite pier. It is so close to an abutment of the railroad bridge and is so dilapidated that it is of no further use.

**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

154. *Beavertail, Rhode Island.*—The 10-inch steam whistle, with Crosby automatic signal, was in operation about 554 hours during the year and consumed some 57 tons of coal.

178. *Point Judith, Rhode Island.*—The first-class steam siren, in duplicate, was in operation about 934 hours and consumed some 63 tons of coal.

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182. *Block Island (southeasterly), Rhode Island.*—The first-class steam siren, in duplicate, was in operation about 907 hours and consumed some 45 tons of coal.

184. *Montauk Point, New York.*—The first-class Daboll trumpet, worked by caloric engines, in duplicate, was in operation about 754 hours and consumed some 6 tons of coal.

190. *New London Harbor, Connecticut.*—The first-class Daboll trumpet, in duplicate, was in operation about 838 hours and consumed some 8 tons of coal.

211. *Little Gull Island, New York.*—The second-class steam siren, in duplicate, was in operation about 617 hours and consumed some 35 tons of coal.

250. *Cornfield Point light-vessel, No. 51, Connecticut.*—The 12-inch steam whistle was in operation about 134 hours and consumed some 29 tons of coal. Light-vessel No. 48, while on this station, ran her 10-inch steam whistle about 503 hours and consumed some 48 tons of coal.

252. *Falkner Island, Connecticut.*—The 10-inch steam whistle, in duplicate, was in operation about 482 hours, and consumed some 41 tons of coal.

256. *Stratford Shoal (Middle Ground), New York.*—The second-class Daboll trumpet was in operation about 445 hours, and consumed some 5 tons of coal.

261. *Penfield Reef, Connecticut.*—The Daboll trumpet, in duplicate, was in operation about 445 hours, and consumed some 2 tons of coal.

263. *Eatons Neck, New York.*—The second-class steam siren, in duplicate, was in operation about 640 hours during the year, and consumed some 43 tons of coal.

268. *Great Captain Island, New York.*—The 10-inch steam whistle, Crosby automatic, in duplicate, was in operation about 366 hours, and consumed some 28 tons of coal.

269. *Execution Rocks, New York.*—The first-class steam siren, in duplicate, was in operation about 308 hours, and consumed some 48 tons of coal.

285. *Sandy Hook light-vessel, No. 48, New York.*—The 10-inch steam chime whistle was in operation about 349 hours during the year, and consumed some 43 tons of coal. Light-vessel No. 51, while on this station, ran her 12-inch steam whistle about 648 hours, and consumed some 87 tons of coal.

297. *North Hook beacon, Sandy Hook, New Jersey.*—The first-class steam siren, in duplicate, was in operation about 1,171 hours, and consumed some 87 tons of coal.

316. *Robbins Reef, New York Harbor.*—The blower siren was in operation about 315 hours, and consumed some 5 tons of coal.

**Third District.****BUOYAGE.**

The weather during the winter was very cold, and heavy moving ice, from February onward, was continuous in all the navigable channels of the district. In New York Bay and Harbor the movement was so constant that the electric-lighted buoys of the Gedney Channel, including the buoy at Southwest Spit, were all extinguished from February 6 to March 9, a period of 32 days, with the exception of a few days at the end of February, when there was an intermittent display by one or more of the electric lamps. At other times, owing to collisions of vessels or defects in the cables, the different lamps were extinguished for short periods, but they were never all out at once. The average extinguishment of each lamp during the year was 51 nights. The Southwest Spit buoy was not relighted until March 25.

The history of the electric-buoy station in the past year is briefly as follows:

*Cables.*—The triple-conductor cables were broken twice, once in August and again in September, and the single-conductor cables five times. The repair of the latter required the expenditure of 600 feet of new cable. The heaviest work of renovation was done by the light-house tenders, while all the minor repairs, including those of pumps, engines, and dynamos, were done by the keepers of the station. On March 5, 1894, the cable of the Southwest Spit electric buoy was fouled and broken by an unknown vessel.

*Plant.*—The new plant furnished consists of two alternating-current dynamos, a switch board, two station transformers, and a Fitzgibbon boiler, which replace the two old upright boilers. The armor of the single-conductor cable is eaten away in parts by corrosion, and is badly worn by long use. The dynamos and engines were run on alternate nights for about ten months, and one set of buoys served throughout the year, with the exception of the buoy at Southwest Spit, which was destroyed by collision. The consumption of coal was 340 tons, or 12 tons less than that of the preceding year.

The dwellings of the keepers were repaired, and the station is now in good order. The shore end of the telephone cable to the Scotland light-ship terminates at this station, and the instruments are in charge of the light-keeper.

On May 2, 1895, the work of installing the cables, buoys, transformers, and other appliances of the new or alternating-current system was begun, and May 14 it was completed and put into experimental operation for 30 days, according to the terms of the contract with the General Electric Company of New York, by whom the new plant was furnished.

The new system embraces eleven buoys, or four more than the old one. The experimental operation was successful. Oil lanterns marked



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the experimental buoys at night until the electric lamps were permanently lighted on July 1, 1895, when the oil lanterns were removed.

A technical description of the new system in working order, together with a report of the operation of the station, embracing tables of the number of vessels using the electric-lighted channel between sunset and sunrise, and of the advantages to navigation conferred by its maintenance, are given in a report to the inspector by his assistant, Lieut. Commander C. H. West, United States Navy, who had charge of the work. An abstract of that report is subjoined:

#### GEDNEY CHANNEL ELECTRIC-LIGHTED BUOYS.

On May 8 and 9, 1895, an alternating system of electric buoys was laid in Gedney and Bayside channels under the direction of Mr. T. H. Gregg, the Board's superintendent of electrical construction.

Ten buoys are lighted in series by a copper-armored single-conductor subaqueous cable, constructed as follows: The single outside armor of the cable consists of eighteen No. 10 B. and S. hard-drawn copper wires. Copper is used for armor to obviate inductance with an alternating current. The single conductor consists of seven No. 18 B. and S. copper wires stranded. The insulation is formed by three coats (0.330 inch) of long-seasoned gutta-percha of best quality. The insulation of the cable is 500 megohms per statute mile. The single core of the cable is served with two coats of best jute-tarred yarn of uniform quality and free from knots. The exterior diameter of the cable is three-fourths of an inch.

Two generators are supplied at the electric buoy station. Each has a capacity of 9 kilowatts and is fitted with commutator and collecting rings so as to supply a continuous current to the Southwest Spit buoy, and an alternating current to the buoys of Gedney and Bayside channels and the North Hook beacon lamp. The generator is self-exciting by means of the continuous current. Each generator has four poles and a speed of 1,200 revolutions per minute. The alternating currents have a frequency of about 40 cycles per second and have cylindrically wound drum armatures with removable coils. Their magnetic circuit is of steel. These generators are fitted in duplicate that there may not be delay in lighting when repairs are needed. They are used alternately every other night. The dynamos are actuated by Armington & Sims high-speed engines.

The station switchboard contains an ammeter for the Gedney and Bayside circuit, an ammeter for the Southwest Spit buoy, a continuous current voltmeter—this current excites the dynamo and also lights Southwest Spit—two Carpenter enamelled rheostats, a double pole, double-throw switch for connecting either of the dynamos on the cable circuit, independent switches for Gedney, Southwest Spit, and station lighting circuits, and two fuse boxes.

One station has a step-up transformer for each dynamo, transforming from 100 to 1,000 volts on the main line; and each end of the line is protected with lightning arresters.

The land wires to Gedney and Southwest Spit circuits are placed underground. They are laid in a 3½-inch square creosoted wooden duct, 3 feet under the sand. The current is carried on a No. 8 B. and S. copper wire, insulated with rubber, and lead sheathed. The whole is surrounded by a fibrous material, soaked in ozokorite. There is also a naked No. 8 tinned copper wire for ground return.

The buoy transformers are fitted with water-tight sheet brass cases and ends of cast brass. They have a capacity of 600 Watts, although only 500 Watts are actually used. They step down from 1,000 volts to 100 volts. These transformers are 10½ inches long by 6½ inches through and weigh 50 pounds each. They are held rigidly

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in the head of the buoy by a cast-brass basket, riveted to the steel frame of the buoy head. The basket lies inside the head of the buoy so that the transformer projects about 2 inches above the head of the buoy. The hole in the head of the buoy is  $7\frac{1}{4}$  inches deep by  $7\frac{1}{4}$  inches diameter. Holes are cut through the head of the buoy to permit free circulation of air, and there is for the same reason a space of half an inch about the whole transformer. The transformer is held tightly in the brass basket by a galvanized iron clamp and thumbscrew. There is a brass collar on the transformer by which it can be lifted.

The primary connection from the cable to the transformer is made by one armor wire from the cable to the brass case of the transformer forming the ground connection. The copper conductor has a T-joint running to the wire connection on the primary side of the transformer. The secondary connection from the transformer to the lamp is made by grounding one of the secondary wires on the inside of the transformer to the brass case. The other secondary wire is run through a brass bushing inside of a lead-covered, rubber-insulated cable, and connects on one side of the incandescent lamp. The other lamp wire grounds on the lantern frame, thus completing the circuit. The return circuit to the dynamo is made on the surface of the copper armor of the submarine cable.

A steel lantern frame is secured to the head of the buoy by wood screws. On the top of the frame a brass plate is secured by thumbscrews, from which rises, as the case may be, a white or red glass globe inclosing a 100-candlepower incandescent lamp.

The North Hook beacon lamp is fed by electricity by tapping the main line abreast the beacon and using a small commercial transformer stepping down from 1,000 volts to 100 volts for the 100-candlepower lamp.

The electric buoys are of juniper, from 45 to 50 feet long, according to the depth of the water, and each is moored by a 5,000-pound iron mushroom sinker. A score is cut on the side of the buoy for the bight of the electric cable to lie in, and this score is covered by a wooden batten secured by clamps. The submarine cable is run in series to each buoy, the buoy transformers being connected in multiple to the circuit.

For the Gedney and Bayside circuit the submarine cable lands on Sandy Hook beach near the North Hook beacon. For 250 feet from the beach it is protected from rocks, etc., by being inclosed in a rubber pipe. The cable then proceeds as follows:

	Feet.
Hook beacon to Buoy B 1.....	10, 860
Buoy B 1 to Buoy E 7.....	2, 700
Buoy E 7 to Buoy E 5.....	2, 200
Buoy E 5 to Buoy E 3.....	2, 200
Buoy E 3 to Buoy E 1.....	2, 200
Buoy E 1 to Buoy E 2.....	1, 100
Buoy E 2 to Buoy E 4.....	2, 200
Buoy E 4 to Buoy E 6.....	2, 200
Buoy E 6 to Buoy E 8.....	2, 200
Buoy E 8 to Buoy B 2.....	3, 300
Cable on buoys, 10 buoys.....	1, 000
Slack cable for raising buoys, 10 buoys at 100 feet.....	1, 000
Total (6.2 statute miles).....	33, 160

In the actual laying of the cable  $6\frac{1}{4}$  statute miles of cable were used, as slack cable had to be allowed to the steamer while laying it in a tideway. On each of the buoys, except that marked B 2, there is a bight of the copper cable running up and down the buoy. Buoy B 2, being the last buoy to which the cable is attached, has only the single part of the cable. The cable is protected at the heels of the buoys by rubber pipe 10 feet long.

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The Southwest Spit electric buoy has a lamp lighted by a continuous current through the steel double-armored cable of the "F" pattern. The length of the cable on this circuit is 10,214 feet.

The alternating systems were worked for 30 consecutive days, 12 hours each day, from May 14, 1895, under the superintendence and inspection of Mr. Gregg. Upon the completion of this 30-day run, Mr. Gregg certified to its good condition. On July 1, 1895, the alternating system was put into official operation for lighting Gedney and Bayside channels and Southwest Spit.

In May, 1895, the two old boilers at the dynamo station were replaced by vertical marine boiler of 40 horsepower.

The number of vessels using Gedney Channel for the fiscal year of 1894-95, and since the date of electric installation, is shown by the following tables:

*Number of vessels using Gedney Channel, New York Lower Bay, between sunset and sunrise, in the fiscal year of 1894-95.*

Fiscal year and month.	Bound in.	Bound out.	Total.
<b>1894.</b>			
July .....	36	3	39
August .....	48	21	69
September .....	57	15	72
October .....	66	38	104
November .....	73	35	108
December .....	80	48	128
<b>1895.</b>			
January .....	43	31	74
February * .....	5	13	18
March .....	30	15	45
April .....	45	26	71
May .....	48	24	72
June .....	30	17	47
Total .....	561	286	847
Average per month .....	47.5	23.8	71.3

\* Buoys inoperative most of February on account of heavy floating ice in New York Lower Bay.

*Synopsis showing the number of vessels using Gedney Channel at night, since the installation of the electric-buoy plant, November 7, 1888.*

Fiscal year.	Number of vessels.			Average per month.		
	Bound in.	Bound out.	Total.	Bound in.	Bound out.	Total.
1888-89 (7 months) .....	171	53	224	24	8	32
1889-90 .....	377	192	569	31.4	16	47.4
1890-91 .....	470	297	767	39.1	24.7	63.8
1891-92 .....	533	252	785	44.4	21	65.4
1892-93 (10 months only) .....	487	215	702	48.7	21.5	70.2
1893-94 .....	648	347	995	54	28.9	82.9
1894-95 (11 months only) .....	561	286	847	47.5	23.8	71.3

Percentage of increase per month, 1893-94 (82.9) over 1888-89 (32)=159.06 per cent.

Percentage of increase per month, 1894-95 (71.3) over 1888-89 (32)=122.81 per cent.

In February last, when heavy fields of ice began to form in the navigable channels, and there was a prospect of their continuance, the iron buoys of the district were replaced by spar buoys. It is due to this cause, and to the fact that the iron buoys which had been carried off by the first overflows of ice were promptly recovered by the tenders, that

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the loss of iron buoys in the past year was not very heavy. This includes four whistling buoys and two bell buoys. The iron buoys were replaced by March 31.

In compliance with a request from the Navy Department a speed trial course was laid off September 14, 1894, for the U. S. torpedo boat *Ericsson*. Ten iron buoys, painted white, were placed as required, and they were removed after the completion of the trial.

Several wrecks were marked with buoys, which were taken up when no longer required. Five ordinary buoys were placed on new stations, and two were discontinued.

### DEPOTS.

*Tompkinsville, Staten Island, New York.*—This is the general depot of the Light-House Establishment. A portion of the annual supplies for the entire service and some of the incidental supplies are purchased, by contract whenever practicable, stored at this center, and distributed by the supply steamer and the freight lines running from New York and vicinity.

The operations performed here are on a large scale, and are well and systematically carried out by a small force of men. The arrangements and appliances are so well adapted to the work that all requirements are met with promptitude and skill. The operations carried on are so quiet and smooth that a visitor would hardly realize the value and extent of the business done here.

The shops for lampists, blacksmiths, carpenters, and boat builders are in full operation; and painting, sailmaking, and repairs of tenders are done by the men employed at general work. The fire department of the depot is made up of the mechanics and laborers of the yard, and the crews of vessels lying at the wharves. It is complete and efficient, so that engines and men are in place, and the lines of hose playing within a few minutes from the ringing of the bell, day or night.

The depot is lighted by electricity from the power house in the yard, and the shops and stores are heated by steam. Economy of expense and safety to the premises are thus secured, while the light furnished is of a better quality than that supplied by outside works. The plant and steam machinery are in good order and well kept.

The storehouse was built in 1863, when space was required for only 2,600 packages. The growth of the service may be inferred from a comparison of figures. In 1894, 9,050 packages were stored, and last year 11,312, without reckoning paints, paint oil, and chimneys, now kept elsewhere. The estimates of last year did not provide for the extension of the storehouse, which would have added to them some \$20,000 more.

The boiler of the power house received a new magnesia covering.

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The extent of the operations carried on at the depot may be gathered from a short résumé of the work.

The lenses from abroad are received, set up, and tested. The clock-work for small lenses and fog signals, and the reflectors, lamps, lanterns, burners, oil cans, etc., are all made at the depot, as well as the important repairs to illuminating apparatus of the service.

Building materials for repairs are kept on hand.

Supplies are received, weighed, tested, stored, and shipped, as required, to all parts of the service.

Similar work is performed with respect to buoys, chains, anchors, ballast balls, and the other articles of outfit and supply for floating aids.

All the machinery for fog signals is set up and tested before use.

Boxes are made, boats are built, vessels repaired, sailmakers and painters are kept busy, and the blacksmith and lamp shops are constantly at work.

These are the merest outlines of the business of the depot, but it shows the great need of providing ample space.

The employment of the depot as the chief center for the purchase and distribution of supplies effects a great saving in the cost, and, with proper facilities, economy would be better served.

Under the direction of the inspector, the operations at this depot, during the year ended June 30, 1895, included the receiving and storing, packing and shipping supplies, buoys and appendages, chain, anchors, rations, fuel, and ship chandlery for light-vessels; loading and unloading the supply vessel and tenders; testing oils, paints, and chimneys; inspecting and weighing rations for the Third district, and stores of various kinds for the general service; overhauling and repairing tenders and making and repairing boats; making and repairing awnings, tarpaulins, and sails, and, as a special service, contributing labor, material, and transportation in the work of laying the new system of electric buoys in the lower bay, and of effecting communication by telephone between Scotland light-ship and Sandy Hook.

Everything practicable was done to systematize and improve the method employed for conducting the great and growing business of the depot. The work of the inspector's office was well and carefully done.

In the storehouse proper new shelves and closets were put up to economize space, the walls were replastered and the interior of the building was painted and kalsomined in part. One of the rooms, as a measure of necessity, was set apart for the use of the superintendent of electrical construction. It was painted, kalsomined, and furnished for the office work and other duties required of him.

Two of the disused lard-oil tanks in the oil vault on the west side of the yard were removed at the beginning of the fiscal year, thus affording room much needed for the storage, in barrels, of linseed, lubricating, and cylinder oils, and turpentine. The laboratory, in which all

**Third District.**

the ordinary tests of oils and chimneys are made, was overhauled, cleaned, painted, and put in good order.

The work done at the general depot by the light-house engineer consists of making and repairing lamps, fitting illuminating apparatus, making oil cans and boxes for supplying oil to light-stations, making light-house and light-ship lanterns, fog signals and their appurtenances, receiving material for manufacturing and repair work, repairing light-houses, oil houses, and other structures, repairing buoys and appendages, and general works of repair in the district. In addition, certain experiments relating to new and improved methods of lighting and to improvements in fog signals are being carried out by him.

*Sea wall.*—The east face sea wall of the south wharf, which was in progress at the beginning of the fiscal year, was completed on August 18, 1894. The metal for the wharf and rear of the wall having been delivered in April, 1894, contract was entered into for its erection, and this was completed on December 28, 1894. Contracts were made for furnishing and delivering metal for the south wharf and for dredging the southern part of the basin.

The following is a list of the improvements needed at this depot, with their estimated cost. They are arranged in the order of their necessity.

**WHARVES AND BASINS.**

South sea wall.....	\$50,000
South wharf.....	15,000
Dredging basin and removing old wharves.....	15,000
Bulkhead and filling.....	40,000
Coal wharf.....	5,000
Extension to lamp shop.....	24,000
New elevator.....	3,000
New boiler room.....	2,500
New engine, in place.....	3,000
New boiler, in place.....	2,000
Additional shafting.....	500

**ADDITIONAL BUILDINGS.**

Coal shed.....	5,000
Hoisting machinery.....	1,000
New oil house.....	20,000
Engineer's storehouse.....	3,000
Extending blacksmith shop.....	1,500

It was stated in the Board's annual report last year that improvements to the extent of \$100,000 are urgently needed during the coming year.

An appropriation of \$25,000 was made by the act approved March 2, 1895, for continuing the construction of the sea wall, rebuilding of the south wharf, and dredging the basin.

### Third District.

It is recommended that \$25,000 be appropriated to carry on such of the foregoing named works during the coming year as may be deemed advisable.

*New London, Conn.*—The work of the light-house steam tender *Cactus*, attending buoys and light-ships, and delivering supplies, is confined chiefly to the eastern section of the district, and she is, therefore, permanently stationed at New London. There is kept here a stock of buoys and appendages, oil, lime, cleansing material, chain cables, anchors, and fuel for use and distribution by her. The two relief ships, Nos. 19 and 20, are kept at this depot ready for service. The condition of light-vessel No. 19, as stated elsewhere, is such that she is not available for duty except for a short time in case of urgent necessity. The coal shed was repaired, and preparations are in progress to repair the wharf.

*Goat Island, Newport Harbor, Rhode Island.*—There is stored here a supply of coal for the stations and light-ships in the vicinity, and for the tenders working in that part of the district. Buoys and appendages, light-vessel chain and anchors to meet emergencies, are also kept at this depot. A new track was laid in the coal house, and the wharf was overhauled and repaired.

*Juniper Island, Lake Champlain, Vermont.*—This depot, kept by the keepers of the light-station on the island, is used for the storage of buoys and appendages, boats and incidental supplies for the service on Lake Champlain. It is in good order.

### TENDERS.

*The Armeria.*—This steel screw steamer made three voyages during the past year, and delivered supplies to the light-houses and light-ships from St. Croix River, Maine, to Point Isabel, Texas. She steamed 16,106 nautical miles on a consumption of 1,170 tons of coal. The supplies delivered were made up of 246,000 gallons of mineral oil, 4,800 boxes of chimneys and cleaning materials, 250 tons of paints, oils, and turpentine, and 12,000 packages of miscellaneous stores, an increase of cargo in everything over that of the preceding year. In addition she delivered 300 tons of special shipments to the depots of the First, Second, Fifth, Sixth, Seventh, and Eighth districts, and she placed buoys in the dredged channel at Charleston, S. C. The *Armeria* encountered severe weather at times, and owing to the heavy seas on the coast of Texas had great difficulty in crossing the bars, but on the whole her voyages were prosperous, and no casualties or accidents worthy of note occurred to vessel or crew. She is kept in a condition of neatness and good order, creditable to the diligence and skill which direct the navigation and services of the vessel and to the discipline maintained on board. During the year repairs were made to the boilers and starboard condenser. She was hauled out to clean and paint

### Third District.

her bottom, and at Baltimore she was docked to remove the sleeves on her propeller shafts. The work was done by her own force. The hull of the vessel is in good condition.

*The John Rodgers.*—This iron side-wheel steamer was laid up 7 days to repair her boiler and to paint ship. She steamed about 8,133 miles, with a consumption of 691 tons of coal. She inspected 51 stations; delivered 463 tons of coal, 17 cords of wood, and various lots of supplies; made 14 shipments of freight for other districts; changed or replaced 236, recovered 14, and cleaned and painted 300 buoys. She was employed 11 days on the electric cable at Sandy Hook, renewed the lamps 10 times, placed 6 of the buoys of the new system, and connected the cable to the whole. She erected 3 oil houses and 3 post lights, and was 80 days employed at the depot preparing shipments and storing supplies. She is kept clean and in good condition, and her work is well and skillfully performed. No extensive repairs were made. She received during the year rope, paint, engineer stores, grate bars, cooking utensils, crockery, and tableware.

*The Cactus.*—This wooden side-wheel steamer was constantly employed. She was laid up for repairs only 5 days. She steamed altogether about 8,913 miles, and consumed some 484 tons of coal. Her work embraced inspection of 106 stations, changing and replacing of 286 buoys, the delivery of 62 lots of rations, 807 tons of coal, 22 cords of wood, 587 packages of supplies, and the painting of all the day beacons and buoys in the eastern section of the district. She was employed 24 days in placing and removing trial buoys for the U. S. torpedo boat *Ericsson*, 34 days in attendance on light-ships, and 27 days at work in the depots. She is kept in good order and her duties are always well done. The *Cactus* received during the year paints, cooking utensils, stove fixtures, crockery, and ship chandlery and minor repairs.

*The Gardenia.*—This wooden screw steamer does special duty in the shipment of supplies to and from the various transportation lines handling freight in New York Harbor and in reaching depots not easily accessible by side-wheel steamers. In the past year she was actively employed in her various duties. She discharges them all carefully and well, and is kept in a condition for service at all times. She was laid off for repairs 21 days in all. She worked on the electric buoys 27 days, replacing broken lamps, underrunning and splicing cables, and assisting the keepers of the station to make repairs. The *Gardenia* assisted also in the installation of the plant for the new system of electric buoys, and was 68 days employed in the experiments for establishing telephonic connection between Sandy Hook and Scotland light-ship. She made regular tours of inspection, carried 29 shipments of freight, placed or replaced 171 buoys, cleaned and painted 106, delivered 305 tons of coal, and was 47 days employed in serving light-ships and gas



**Third District.**

buoys and in doing work at the general depot. In performing this service she steamed about 8,485 miles and consumed some 433 tons of coal. Her repairs consisted of a new shaft and wheel, a wrought-iron rudder post, and a keelstrap. She received bedding, crockery, medicines, engineer supplies, cooking utensils, and ship chandlery.

*The Daisy.*—This little wooden screw steamer has taken the place of the steam launch *Bouquet*, which was destroyed at her moorings during a hurricane in the fall of 1893. The *Daisy* was fitted and equipped for the special service of attending to the electric-lighted buoys in Gedney Channel. She is 54 feet long, 13 feet 8 inches broad, and 5 feet 8 inches deep. She has a compound condensing engine of about 30 horsepower and one upright tubular boiler, and is well adapted to her work. Her employment in attending to the electric buoys, in place of the larger light-house steam tenders, will enable them to do much more general service.

*The Mistletoe.*—This side-wheel steamer was almost entirely engaged on works of repair. Her hull is in fair condition, but her boiler and engine need renewal. For several years, in the reports of the Light-House Board, it has been recommended to build a new tender to replace the *Mistletoe*, but no money has thus far been appropriated for this purpose, and she is now in such a condition that it is hardly possible to keep her in running order during the period that must elapse before a new boat can be built, even if Congress should make the necessary appropriation at its next session, without a considerable outlay for repairs.

During the year she has run 6,762 miles, with a consumption of 447.6 tons of coal.

The following statement was made in the Board's last annual report:

*Tender for engineer of the Third light-house district.*—The engineer's tender, the *Mistletoe*, is the oldest tender in this district, and one of the oldest in the service. She was built in 1871-72. She has done good service, but to put her in effective condition would require new boilers, engine, shafting, wheels, and such other radical changes that it would be more economical to build a new boat of a stronger and more modern type.

With the hard and continuous service to which she is generally put to keep such a large district as this in proper repair, her boiler and machinery continue to deteriorate, and after nearly every long trip she has to be laid up for several days for imperative repairs. This is a loss not only of money but of valuable time, and might be the cause of a very serious accident in case some important aid to navigation should be disabled on account of having no boat available to promptly put it in repair.

The following statement was made in the Board's last three annual reports:

A new steel screw steamer is needed to take the place of an old side-wheel steamer. The latter has been nearly worn-out by long and hard service in the waters of Long Island Sound and on the seacoast of New York. She is too small to do the work of the Third light-house district properly. She is so slow that a great deal of time is

### Third District.

lost unnecessarily. The needs of this district, which is the largest and most important of the country, would be far better and more economically subserved by a steamer of the latest design.

It is estimated that such a steamer can be built, fitted out, and made ready for service for, say, \$85,000, and it is recommended that an appropriation of this amount be made therefor.

*The Rose.*—This little screw steamer is, at the end of the year, out of commission on account of the unsatisfactory condition of her boiler and engine. Proposals have been received for furnishing and installing a new boiler and engine. During the year she has run 1,665 miles, with a consumption of 107.1 tons of coal.

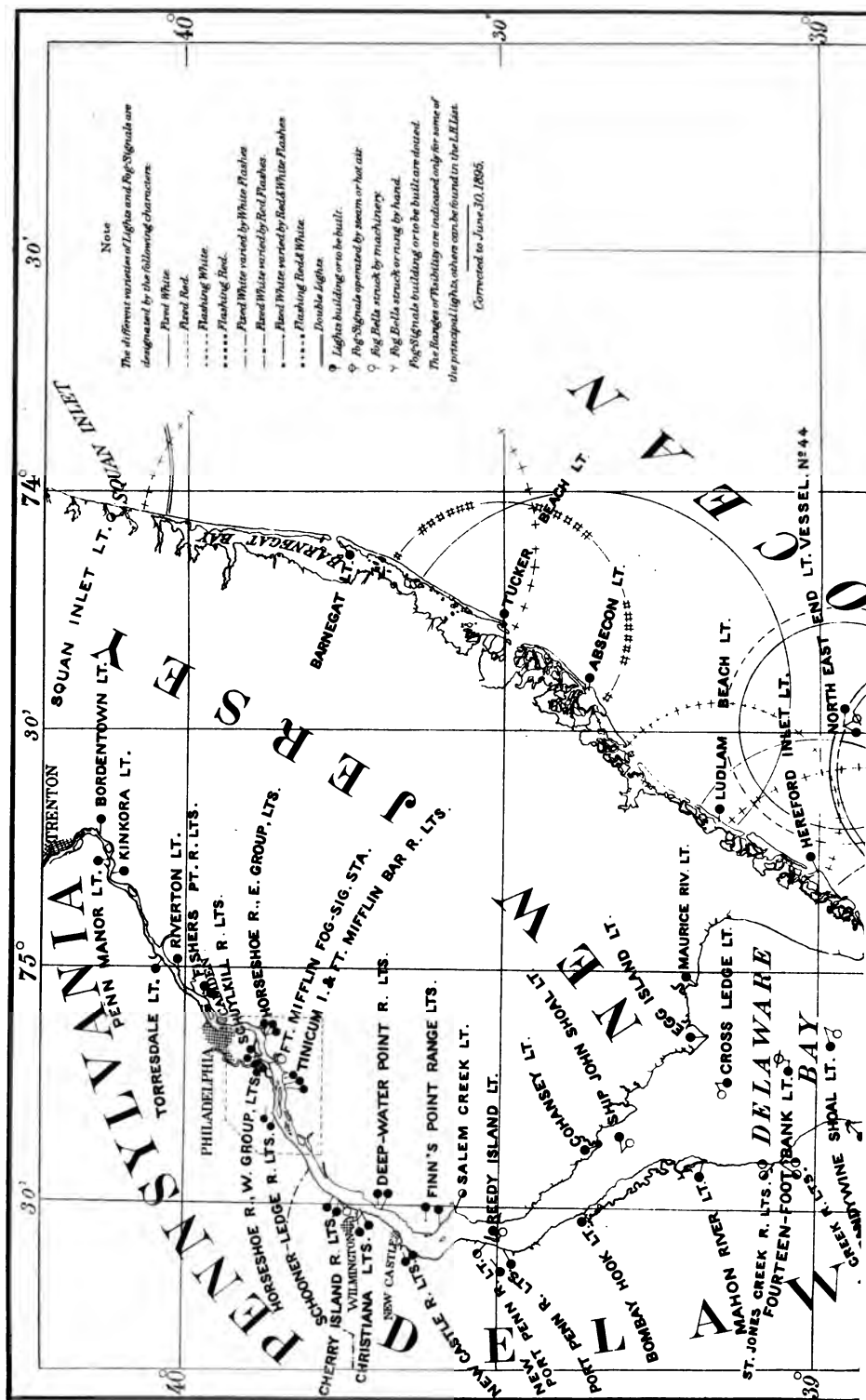
*The Nettle.*—This wooden steam screw launch was usefully employed in Lake Champlain, the Hudson River, and in carrying workmen and light freight about New York Bay and Harbor. During the year she has run about 2,193 miles, with a consumption of 47.4 tons of coal.

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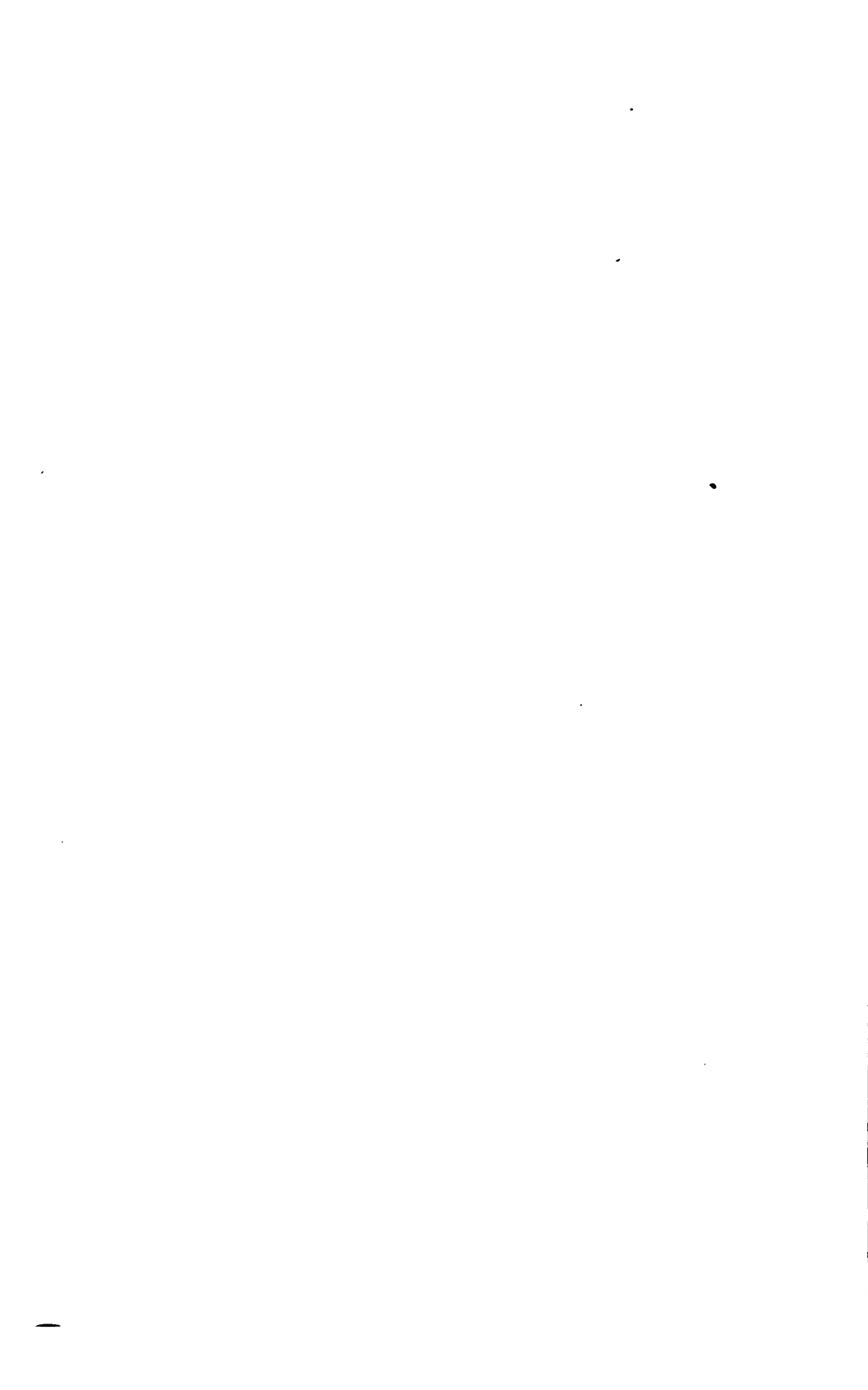
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## FOURTH DISTRICT.

This district extends from a point on the coast of New Jersey opposite Shrewsbury Rocks (but does not include the rocks) to and including Metomkin Inlet, Virginia. It embraces all aids to navigation on the seacoast of New Jersey, Delaware, Maryland, and Virginia, and the tidal waters tributary to the sea between the rocks and the inlet.

*Inspector*.—Commander George C. Reiter, United States Navy.

*Engineer*.—Maj. Charles W. Raymond, Corps of Engineers, United States Army.

In this district there are:

Light-houses and beacon lights, including 7 post lights.....	57
Light-ships in position.....	4
Day or unlighted beacons.....	5
Fog signals operated by steam or hot-air engines.....	6
Fog signals operated by clockwork.....	7
Lighted buoys in position (gas).....	2
Whistling buoys in position.....	4
Bell buoys in position.....	6
Ice buoys for winter use.....	52
Other buoys in position.....	187
Steamer <i>Zizania</i> , buoy tender and for supply and inspection.....	1
Naphtha launch, used for works of construction and repair.....	1

## LIGHT-HOUSES.

371. *Squan Inlet, seacoast of New Jersey*.—The difficulties in the way of procuring a clear title to the site selected have, it is believed, been removed, and the title papers are now in the hands of the Department of Justice.

372. *Barnegat, seacoast of New Jersey*.—The site around the building, which was in a rough and unsightly condition, was surrounded by a timber-retaining wall, filled in, graded, and covered with gravel, to protect it from windstorms. The bulkhead, built last year to protect the beach and reservations from the inroads of the sea, has so far accomplished its purpose successfully. Various repairs were made.

374. *Absecon, Atlantic City, seacoast of New Jersey*.—Information was received that several persons were erecting buildings on light-house land. A written protest was served on each. Various repairs were made.

375. *Ludlam Beach, Sea Isle City, seacoast of New Jersey*.—A detached brick oil house was built. Various repairs were made.

**Fourth District.**

380. *Cape Henlopen, entrance to Delaware Bay, Delaware.*—The old porches of the keepers' house were torn down and new ones built. An elevated walk was also built from the tower to the dwelling. Various minor repairs were made.

381. *Delaware Breakwater, East End, Delaware.*—The watch room was provided with an iron outer storm door, and the inner door was renewed. An additional set of boat davits was placed on the landing. Both fog-signal engines broke down, and the signal was silent from May 5 to May 9, 1895. They were repaired, and are now in good working order.

— *Delaware Breakwater, West End, Delaware Bay, Delaware.*—A red iron post was erected, carrying a lens lantern showing a red light, to mark the western extremity of the Delaware Breakwater ice breaker.

383. *Delaware Breakwater range (rear), near Lewes, Del.*—A new water tank was erected and minor repairs were made.

384. *Mispillion Creek, Delaware Bay, Delaware.*—A portion of the banks surrounding the station was rebuilt, and small repairs were made.

— *Murderkill Creek, Delaware Bay, Delaware.*—Two posts were erected carrying range lights, which will mark the dredged channel to the entrance of Murderkill Creek, Delaware.

— *St. Jones Creek, Delaware Bay, Delaware.*—Two posts were erected carrying range lights to mark the dredged channel to the entrance of St. Jones Creek, Delaware.

— *Maurice River range lights, Delaware Bay, New Jersey.*—The following recommendation, which was made in the Board's last annual report, is renewed:

It is claimed that some 500 sailing vessels are engaged in the oyster trade on Maurice River during the season, and that they give employment on an average to 1,500 men; in addition, a number of coasting vessels visit this river, and the establishment of manufactures at Millville, N. J., is increasing the marine traffic. The value of this commerce is sufficient to warrant the establishment of range lights to mark the entrance to Maurice River. It is estimated that the surveys and examinations, the sites, the erection of the range lights, and the keeper's quarters will cost not to exceed \$4,500. Recommendation is made that an appropriation of this amount be made therefor.

389. *Cross Ledge, Delaware Bay, New Jersey.*—About 1,375 cubic yards of riprap, consisting of heavy blocks of stone weighing from 2 to 6 tons each, were placed around the station for its protection. This work was begun during the preceding year and completed in July, 1894.

390. *Mahon River, Delaware Bay, Delaware.*—The following recommendation, made in the Board's last annual report, is renewed:

The constant washing away of the bank has made it necessary to remove and rebuild the light-house structure four times since its first erection in 1831. The present station is now threatened with early destruction. The surrounding marsh is soft, yielding mud, and the building protected by its bulkhead being but 60 feet



**Fourth District.**

from high-water mark on the south and 125 feet on the east, the cost of further protection would be great and of uncertain results. This station is hardly of sufficient importance to justify the expense of the construction of an isolated site for its use. The present building is of wood, the outer walls being lined with brick laid in mortar; hence it would be unwise to attempt its removal over the soft marsh. The Board therefore recommends that a new site be purchased about 1,500 feet NNW. of the present site; also that a detached skeleton wooden tower, specially designed so that it could be moved if necessary, be built for the display of this light upon the proposed new site. It is estimated that this can be done at an expense not exceeding \$8,500, and it is recommended that an appropriation of this amount be made therefor.

Toward the close of the fiscal year a red sector, marking the locality of the Joe Flogger Shoal (upper end) buoy and the northern entrance to Blake Channel, was placed in the lantern of this light.

391. *Ship John Shoal, Delaware Bay, New Jersey.*—About 1,670 cubic yards of riprap stone, in pieces weighing from 2 to 6 tons each, were placed around the station for its protection from heavy ice. This work was begun during the preceding year and completed in July, 1894.

394. *Port Penn range (front), below Port Penn, Delaware River, Delaware.*—The characteristic of the light was changed in February, 1895, from fixed white to fixed white during periods of 2 seconds, separated by eclipses of 1 second's duration. Minor repairs were made.

395. *Port Penn range (rear), below Port Penn, Delaware River, Delaware.*—New fences were built on the boundary line of the reservation.

397. *Port Penn wharf, Delaware River, Delaware.*—A site for this new range light was selected, purchased, and surveyed. Plans and specifications for the keeper's dwelling and tower were prepared, and contracts for their erection and for furnishing the metal work were awarded on bids called for by public advertisement.

398. *Salem Creek, Delaware River, New Jersey.*—An appropriation of \$800 was made by the act approved August 18, 1894, to establish this light. A site for the light was selected. Plans for the structure were prepared and proposals for its erection were invited.

399. *Finns Point range (front), Delaware River, New Jersey.*—The characteristic of the light was changed about the close of October, 1894, from fixed white to fixed white during periods of 2 seconds, separated by eclipses of 1 second's duration. Various repairs were made.

401. *New Castle range (front), Delaware River, New Jersey.*—The characteristic of the light was changed about the close of October, 1894, from fixed white to fixed white during periods of 2 seconds, separated by eclipses of 1 second's duration. Minor repairs were made.

403. *Deep Water Point range (front), Delaware River, New Jersey.*—The characteristic of this light was changed at the end of October, 1894, from fixed white to fixed white during periods of 2 seconds, separated by eclipses of 1 second's duration. A survey was made of the right of way to the station, and it was found that it had become impassable and useless.

### Fourth District.

405. *Christiana beacon, Delaware River, Delaware.*—Measurements were made to determine the amount of settlement of the crib upon which the beacon is erected.

406. *Christiana, Delaware River, Delaware.*—The river banks about the station were rebuilt and made higher. An elevated board walk, about 1,800 feet long, was built to connect the station with the beacon light. Several of the old fences were replaced. A new cistern was built. Various repairs were made.

407. *Cherry Island range (front), Delaware River, Delaware.*—The characteristic of the light was changed about October 30, 1894, from fixed white to fixed white during periods of 2 seconds, separated by eclipses of 1 second's duration. The upper portion of the foundation pier of the light was torn down and rebuilt. During the progress of this work the tower was moved back a few feet on the range. The fence around the station was renewed and minor repairs were made.

409. *Schooner Ledge range (front), Delaware River, Pennsylvania.*—Further repairs were made to the sea wall, a concrete protection was placed around the dwelling, the site was partly filled in, a new cistern and new boat davits were furnished, and minor repairs were made. The characteristic of the light was changed about October 30, 1894, from fixed white to fixed white during periods of 2 seconds' duration, separated by eclipses of 1 second's duration.

410. *Schooner Ledge range (rear), Delaware River, Pennsylvania.*—A new boundary fence was built and various repairs were made.

411. *Billingsport range (front), Delaware River, New Jersey.*—The characteristic of the light was changed about October 30, 1894, from fixed white to fixed white during periods of 2 seconds' duration, separated by eclipses of 1 second's duration. Minor repairs were made.

414. *Fort Mifflin fog signal, Delaware River, Pennsylvania.*—The frame tower was moved back about 40 feet from its former position and rebuilt.

433. *Assateague, seacoast of Virginia.*—A new boat landing was built.

### REPAIRS.

At each of the following-named stations, repairs of greater or less extent were made during the year:

373. Tucker Beach, N. J.	404. Deep Water Point range (rear), N. J.
379. Cape May, N. J.	408. Cherry Island range (rear), Del.
382. Delaware Breakwater range (front), Del.	412. Tinicum Island range (rear), N. J.
387. Maurice River, N. J.	413. Fort Mifflin Bar Cut (rear), N. J.
388. Egg Island, N. J.	415, 416, 417. Horseshoe range, West Group, Pa.
392. Cohansey, N. J.	418, 419, 420. Horseshoe range, East Group, N. J.
393. Bombay Hook, Del.	431. Fenwick Island, Del.
400. Finns Point range (rear), N. J.	

**Fourth District****LIGHT-VESSELS.**

377. *Northeast End light-vessel, No. 44, off the seacoast of New Jersey.*—This vessel was removed from her station on July 25, 1894, and a whistling buoy took her place. The vessel was docked August 1, 1894, when her bottom was cleaned and painted with two coats of germicide paint, and a few minor repairs were made to the ventilators and the like. Some 33 tons of coal were placed on board, and on August 3 she was taken to the Edgemoor light-house depot, where she received anchors and chains. On the night of August 4 she left in tow of the tender *Zizania* for her station, where she arrived next day. About 100 feet of 2½-inch hose, coal, wood, dishes, globe valves, rations, etc., were supplied. A new boat, 26 feet long, was furnished. A copper thermometer, together with light-vessel lamps, were also supplied. On September 1, 1894, she was anchored in 84 feet of water, about 2 miles E. ½ S. from her former position.

378. *Five-Fathom Bank light-vessel, No. 40, off the seacoast of New Jersey.*—On September 1, 1894, she was moored in 93 feet of water, about 1½ miles SSE. ½ E. from her former position. Rations, wood, coal, hose, paint, main staysail, rope, rods, washers, grate bars, etc., were supplied. The large boat was repaired.

430. *Fenwick Island Shoal light-vessel, No. 52, off the seacoast of Maryland.*—This vessel was removed from her station on August 5, 1894, and brought to Edgemoor depot, where her anchors and chains were removed. On August 8 she was docked, the bottom cleaned and painted on the starboard side with two coats of Struck's elastic paint, and on the port side with two coats of germicide paint. On August 10 she received 35 tons of coal and was taken to Edgemoor light-house depot. The anchors and chains were replaced and she was towed by the tender *Zizania* to her station, where, on August 12, 1894, she was moored. Some 90 tons of coal and about a cord of wood, sails for the boat, stovepipe, provisions, etc., were supplied; also eight panes of plate glass for lanterns and six light-vessel lamps.

432. *Winter-Quarter Shoal light-vessel, No. 45, off the seacoast of Virginia.*—This vessel was withdrawn from her station on January 17, 1895, for repairs, and was brought to the Edgemoor light-house depot, where her anchors and chains were taken out and placed on the wharf. On May 3 the vessel was placed in the hands of the contractors, when the following work was done: The old boilers of the fog signal were removed, the vessel was docked, the old zinc metal was taken off, some 472 running feet of yellow-pine outside sheathing were renewed, the seams of the outside sheathing were calked from the keel to the top, the bottom was resheathed with rolled zinc sheathing metal, 28, 30, and 32 ounce, in equal proportions, fastened with 1½-inch yellow-metal nails; the sheets were double punched, a new hawse pipe was put in on

**Fourth District.**

the port side, five vertical fenders were placed, two on the starboard side and three on the port side, and the large boat was repaired, refastened, and calked. The spar and forecastle decks were recalced and the seams were payed with white lead. One new fore jack mast was furnished, the fore and aft fenders were repaired, the socket for the boat davit and the gallows frame for the boat were repaired. The after hatches were fitted to batten down, a new white ash ladder was supplied for the forecastle, the deck pump was repaired, a new scuttle, with cover, was supplied for the forecastle deck, and other minor repairs were made. A Crosby automatic fog signal was furnished. Wood, rations, canvas, rope, mats, linings and grates for the galley stove, and an 8-inch chime whistle were also supplied.

— *Relief light-vessel, No. 9.*—On January 7, 1895, this vessel arrived at the Delaware Breakwater in tow of the tender *Azalea*. A mushroom anchor, 45 fathoms of 2-inch chain, and 3 tons of coal were supplied to her, and on January 17 she was placed on Winter-Quarter Shoal station, relieving light-vessel No. 45, which was then there. Lime, paint, turpentine, coal, and canvas were supplied. Her fog signal is a bell.

— *Relief light-vessel for the Fourth light-house district.*—The following recommendation, made in the Board's last annual report, is renewed:

During the recent cyclones light-ship No. 37, stationed off Five-Fathom Bank, coast of New Jersey, Atlantic Ocean, in the Fourth light-house district, was wrecked. There is now no relief light-ship in the Fourth light-house district. The interests of commerce and navigation urgently require that a new vessel should be provided to replace the wrecked vessel at the earliest day practicable. It is estimated that the construction and establishment of a first-class light-vessel, with a steam fog signal, suitable for Five-Fathom Bank, will cost \$70,000, and it is recommended that an appropriation of that amount be made therefor. When that is done the vessel now on Five-Fathom Bank can be used as a relief light-vessel, and can be held in reserve to take the place of any one of the light-vessels now on stations in the Fourth light-house district whenever any of them may become disabled.

— *Light-vessel for Overfalls, or South Shoal, entrance to Delaware Bay.*—The following recommendation, made in the Board's last annual report, is renewed:

Petitions have been made during the past year to this office by the American Association of Masters and Pilots from Camden, N. J., Boston, Mass., New London, Conn., and from officers of the steam colliers and sea tugs of the Philadelphia and Reading Transportation Line for the establishment of a light-vessel at the Overfalls, or South Shoal, entrance to Delaware Bay. While the entrance to Delaware Bay is well lighted and can be entered with safety in clear weather, the entrance is difficult and dangerous in thick and stormy weather. Neither the whistling buoy on South Shoal nor the Daboll trumpet on Delaware Breakwater can be heard always at a safe distance. Mariners have been within half a mile of Delaware Breakwater with the Daboll trumpet in operation without being able to hear it. The entrance to the Delaware Bay is shoal on the northern side from Cape May to the Overfalls buoy, and "steep to" at Cape Henlopen. This makes it the more necessary that this shoal be well marked by a light-vessel having a more powerful fog signal. It is estimated that such a light-vessel could be established here for not to exceed

**Fourth District.**

\$70,000. Recommendation is therefore made that an appropriation of this amount be made for that purpose.

It is claimed that if the light-vessel is established, the following changes, all in the interest of economy, can be made:

The Delaware Breakwater front and rear lights can be discontinued.

The Cape May light can be changed from the first to the third order.

Two post lights can be established in place of the Delaware Breakwater front light, a red one to be exhibited from the present building, and a white one on the extreme western end of the ice breaker. These two lights can be attended by one keeper, to occupy the present dwelling.

*Reimbursement of seamen's losses.*—The following recommendation, made in the Board's last annual report, is renewed:

The honorable the Secretary of the Treasury, at the instance of the Board, wrote to the Speaker of the House of Representatives on September 28, 1894, asking that proper measures might be taken to reimburse the legal representatives of Howard Selover, mate of light-ship No. 37, and George Richardson, a seaman on the same vessel, for the value of the clothing lost when they were drowned on the occasion of the foundering of that vessel. The amounts named in the sworn statements, which were transmitted and recommended by the inspector of the Fourth light-house district, were \$77.25 in the first case, and \$50 in the other.

**DAY OR UNLIGHTED BEACONS.**

*Cape Henlopen day beacon.*—Wooden skeleton of pyramidal form, 49 feet high, latticework painted black with white band, located two-thirds of a mile from Cape Henlopen light-house. In good condition.

*Broadkill day beacon.*—This beacon consists of a post crossed with a board 5 feet long, painted white, showing the name "Broadkill" in large black letters, and is in good condition.

*Delaware Breakwater day marks, Delaware.*—These, one on the Delaware Breakwater and one on the ice-breaker, point toward each other, are hand-shaped, and are painted white, with words, "Danger through gapway," on each in black letters. These marks are in good condition.

*Rum Point day beacon, Absecon Inlet.*—This is located on Rum Point, Absecon Harbor, and consists of a post crossed with five boards, 5 feet long, placed at right angles, painted black and white, and is in good condition.

**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

377. *Northeast End light-vessel, No. 44, New Jersey.*—The 12-inch steam whistle was in operation some 731 hours, and consumed about 33 tons of coal.

378. *Five-Fathom Bank light-vessel, No. 40, New Jersey.*—The 12-inch steam whistle was in operation some 649 hours, and consumed about 30 tons of coal.

381. *Delaware Breakwater, east end, Delaware.*—The second-class Daboll trumpet was in operation some 732 hours, and consumed about 5½ tons of coal.

**Fourth District.**

386. *Fourteen-Foot Bank, Delaware Bay, Delaware.*—The second-class Daboll trumpet was in operation some 335 hours, and consumed about  $2\frac{1}{4}$  tons of coal.

430. *Fenwick Island Shoal light-vessel, No. 52, Maryland.*—This 12-inch steam whistle was operated about 346 hours, and consumed about 55 tons of coal.

432. *Winter-Quarter Shoal light-vessel, No. 45, Virginia.*—This 12-inch steam whistle was not in operation during the year.

**BUOYAGE.**

There were maintained last year on the seacoast from Squan Inlet, New Jersey, to Chincoteague Inlet, Virginia, 25 buoys; in Barnegat Inlet, New Jersey, 9 buoys; in Tucker Cove and Little Egg Harbor Inlets, New Jersey, 12 buoys; in Absecon Inlet, New Jersey, 5 buoys; in Great Egg Harbor Inlet and River, New Jersey, 13 buoys; in Townsend Inlet, New Jersey, 3 buoys; in Hereford Inlet, New Jersey, 5 buoys; in Delaware Bay and River and Schuylkill River, 119 buoys; in Chincoteague Inlet, Virginia, 5 buoys; and in Metomkin Inlet, Virginia, 3 buoys; in all 199 buoys.

**BUOYS PLACED DURING THE YEAR.**

Three first-class red spar buoys, to mark the starboard side of the channel off Windmill Island, Delaware River.

One first-class nun buoy, with red and black horizontal stripes, to mark the bow of the steamer *Alleghany*, Delaware Bay.

One second-class can buoy, with red and black horizontal stripes, to mark the stern of the steamer *Alleghany*, Delaware Bay.

One first-class nun buoy, with black and white perpendicular stripes, off Bombay Hook, Delaware Bay, and about one-eighth of a mile to the westward of the Port Penn range line.

One gas-lighted buoy, red, to mark the bow of the steamer *Alleghany*, Delaware Bay.

One first-class can buoy, with red and black horizontal stripes, to mark the wreck of the schooner *Marion F. Sprague* off the seacoast of New Jersey.

One red iron ice buoy to mark the bow of the steamer *Alleghany*.

**DEPOTS.**

*Edgemoor supply and buoy depot, Delaware River, Delaware.*—About 4,200 cubic yards of mud were dredged out along the line of the south wharf; 150 feet of stone sea wall, protecting the bulkhead along the south line of the reservation, were built; about 90 linear feet of the old south wharf were removed and rebuilt, the deck planks were renewed,

**Fourth District.**

and the stringers leveled up for an additional 150 feet, and the sheet piling was renewed where found necessary. Numerous minor repairs were made to other portions of the dock.

The storehouse is in good condition and the stores are neatly arranged. The stairway leading to the second floor was inclosed.

The following recommendation was made in the Board's last annual report:

The wharf of this depot is in a bad condition, and if its deterioration is allowed to continue unchecked the usefulness of the depot will soon be destroyed. Repairs are being made sufficient to enable the Board to carry on the work of the depot during the ensuing year, but in addition the following-named work should be done at an early day, to enable the depot to fully serve its purpose. The whole basin should be dredged to a depth of 9 feet. At present about half the basin is bare at low water. All three of the inner cribs of the south wharf and the portions of the pier joining them ought to be rebuilt. The bulkhead wall should be entirely rebuilt. New decking and new sheet piling are needed in all parts of the piers, and new foundations are needed under the north wall of the storehouse.

The estimated cost of this work is—

North wharf.....	\$6,930
South wharf.....	8,635
Bulkhead, etc.....	12,815
Dredging basin.....	2,420
Total.....	30,800

It is estimated that \$20,000 can be profitably expended during the coming year on this work, and it is recommended that an appropriation of this amount be made therefor.

*Absecon, near Atlantic City, N. J.*—A survey is necessary to determine the exact location of the site. This will soon be made, and the building, provided for by the appropriation made by act approved August 18, 1894, of \$1,200 additional, will then be erected.

*Chincoteague Inlet, Virginia.*—The purchase of the additional land required for the site provided for by the act approved August 30, 1890, was deferred on account of its exorbitant price.

The spare buoys for Chincoteague and Metomkin inlets are stored here. It is also used as a depot for Assateague and Killick Shoal light-houses and for the care of boats from Winter-Quarter Shoal light-vessel. The depot occupies half of a small wharf, and the frontage of the wharf is inadequate to properly accommodate the tender while lying there. The buoy house is not adapted to the care of the light-vessel's boats.

*Cape May boathouse, New Jersey.*—Plans for this building were prepared. It was provided for by the additional appropriation of \$500 in the act approved August 18, 1894. It will be begun at an early date.

**Fourth District.****TENDERS.**

*The Zizania*.—This steel twin-screw steamer was constantly employed, except during 49 days, when she was laid up for repairs. On May 10, 1895, while off Hereford Inlet, New Jersey, the starboard propeller was lost. The following named repairs were made: New bearings for the grate bars were fitted; packing was placed in the high-pressure pistons; a guard was furnished for the feed pump; a collar was supplied for the thrust bearing; linings were supplied for the furnace fronts; new propeller wheels were supplied; brass sleeves were fitted on the shafts; the stern bearings were refitted; new grate bars, new check valves, and the like, were supplied.

On August 8, 1894, the *Zizania* was docked, and her bottom was cleaned and painted with two coats of red lead and white zinc. Upon examination of the rudder the pintles and gudgeons were found to be badly corroded and worn. To remedy this defect, six steel sleeves were fitted on the pintles and bushings on the saucers. On May 28, 1895, the vessel was docked, and two new iron propellers were put on. The vessel resumed her duties on June 11, 1895.

The tender was engaged in attending to the buoyage of the district, towing light-vessels to and from their stations, and in delivering fuel and supplies to light-houses, light-vessels, and post lights. Two trips were made to the general light-house depot for supplies and buoys.

She replaced and restored 20 buoys, changed 168, placed 9, painted 11, removed 7, renewed 65, and recovered 12 buoys. She landed 112 tons of coal and  $8\frac{1}{2}$  cords of wood at light-houses, and 177 tons of coal and  $5\frac{1}{2}$  cords of wood at four light-vessels. The crew was employed 70 days at Edgemoor light-house depot and at the iron pier at Lewes, Del.

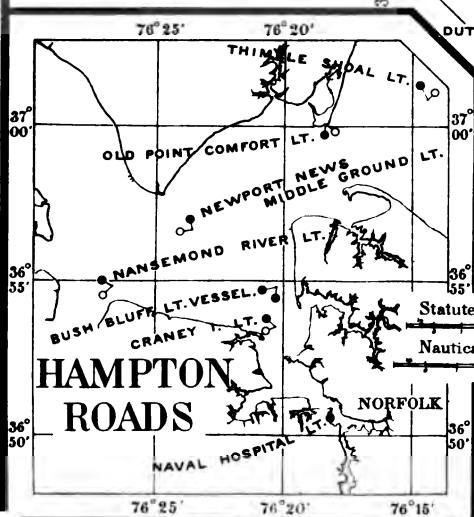
She delivered the annual allowance of provisions to four light-vessels and eleven light-stations. She also conveyed the inspector to the light-stations of the district for the purpose of inspection, and she delivered the necessary supplies to the stations. In doing the above work she steamed 15,372 miles, and consumed about 916 tons of coal and some 4 cords of wood.

Necessary supplies, such as rope, oil, waste, soda, paint, packing, baskets for coaling stations, rations, dishes, etc., were furnished.

The naphtha launch assigned for the use of this district in July, 1894, was used on works of repair, etc., principally at Egg Island, Cohansey, Maurice River, and Christiana light-stations, and at the Edgemoor depot.







TER SHOAL LT.VESSEL, NR 45

The different varieties of Lights and Fog-Signals are designated by the following characters:

- \_\_\_\_\_ Fixed White.
- ..... Fixed Red.
- ..... Flashing White.
- ..... Flashing Red.
- \_\_\_\_\_ Fixed White varied by White Flashes.
- \_\_\_\_\_ Fixed White varied by Red Flashes.
- ..... Fixed White varied by Red & White Flashes.
- ..... Flashing Red & White.
- \_\_\_\_\_ Double Lights.

Ⓛ Lights building or to be built.

⚙ *Fog-Signals operated by steam or hot air*

♀ *Fog Bells struck by machinery.*

Y *Fog Bells struck or rung by hand.*

*Fog Signals building or to be built are dotted.*

*The Ranges of Visibility are indicated only for some of the principal lights, others can be found in the L.H. list.*

*Corrected to June 30, 1895.*





## FIFTH DISTRICT.

This district extends from, but does not include, Metomkin Inlet, Virginia, to and including New River Inlet, North Carolina. It embraces all aids to navigation on the seacoast of Virginia and North Carolina, between the limits named, all of Chesapeake Bay, the sounds of North Carolina, and tributary waters.

*Inspector*.—Commander Yates Stirling, United States Navy, to October 1, 1894; since then Commander Benjamin P. Lamberton, United States Navy.

*Engineer*.—Capt. Eric Bergland, Corps of Engineers, United States Army.

In this district there are:

Light-houses and beacon lights, including 2 post lights.....	113
Light-ships in position, including tender <i>Holly</i> .....	3
Day or unlighted beacons.....	10
Fog signals operated by steam or hot-air engines.....	3
Fog signal operated by petroleum engine.....	1
Fog signals operated by clockwork.....	63
Whistling buoy in position.....	1
Bell buoy in position.....	1
Lighted buoy in position.....	1
Other buoys in position, including pile buoys and stakes.....	1,079
Steamers <i>Maple</i> and <i>Violet</i> , buoy tenders, and for supply and inspection.....	2
Steam launch <i>Bramble</i> , used to supply gas to the beacons in the sounds of North Carolina.....	1
<i>Sharpie</i> (and gas tank) for supplying beacons and coast stations.....	1
Steamers <i>Jessamine</i> and <i>Thistle</i> , for construction and repairs.....	2

## LIGHT-HOUSES.

435. *Hog Island, Great Machipongo Inlet, seacoast of Virginia*.—On the passage of the act approved August 18, 1894, appropriating \$75,000 for completing the new light-station, measures were taken to procure the necessary material for temporary buildings and working plant at the site. By January, 1895, the quarters for the working party, a cistern, storehouses and shop, a tramway leading from the wharf to the site, and a boom derrick, boiler, and engine on the wharf had been erected. The work was much delayed by failure to receive material at the times arranged for.

The preparation of the foundation for the tower was then begun. Concrete piers, eight in number, 11 feet square at the base and 6 feet

**Fifth District.**

6 inches high, with pile and grillage supports, were formed at the angles of the perimeter of an octagon of which the circumscribed circle has a diameter of 26 feet 6 inches; and a similar pier, 14 feet square, of the same height, and resting on piles and grillage, was constructed at the center of the circle. Bolts were built into the perimeter piers during the process of depositing the concrete in the molds to form the blocks, for the purpose of anchoring the outer columns of the tower, the inner pier serving to support the central cylinder of the light-house containing the stairs and elevator. These piers were completed in April, 1895, the work having been considerably retarded by the unusual severity of the winter. Besides these, three smaller piers were built in May for supporting the outer stairway and platform of the tower.

Meantime, the preparation of the woodwork of the dwellings and other buildings for the station was progressing satisfactorily at the depot. As the material for each building was completed it was properly arranged for shipment and transported at intervals by a hired schooner. Most of the work had in this way been delivered by the end of February, 1895, and in March excavation for the foundation of the two dwellings for the assistant keepers, and in May, 1895, for the principal keeper's house, was begun.

The metal work for the tower was delivered at the station on June 14, 1895, and its erection was at once begun by the contractor's working party. By the end of the month the iron disks had been set on the foundation piers over the anchor bolts and bedded in cement. The cylinder belt of the stairway, the wrought-iron struts connecting the disks to the cylinder, and the castings for the latter, had been put in place and bolted, bringing the central cylinder up to a height of 27 feet. The three keepers' dwellings are well advanced toward completion, the store and out houses for all the dwellings have been built, but have yet to be moved to permanent foundations, and the foundations for the workshop, for the storehouse, and for the oil house are partly built.

About one-half of the light-house premises has been graded by filling in low places with sand.

*437. Cape Charles, on Smith Island, entrance to Chesapeake Bay, sea-coast of Virginia.*—At the beginning of the fiscal year, July 1, 1894, the tower had been partly erected, the two dwellings for assistant keepers had been roofed and the upper floors laid, the workshop was under roof ready for the inside work, the stable was finished except the second coat of paint, and four woodsheds and outbuildings had been built, but not yet placed on the foundations to be made ready for them.

On November 15, 1894, work was recommenced at the site. All the buildings above referred to were finished, and the principal keeper's dwelling, the cisterns, and oil house were begun and completed. The light-house premises were thoroughly graded, and the greater part of a marsh north of the keeper's dwelling was filled with earth. A neat

### Fifth District.

fence was built around the grounds in May, and this practically completed the work, except the setting of the lens. The extreme severity of the weather during the winter interfered materially with the progress of operations.

In June, 1895, the lens apparatus was taken to the station and successfully installed. The characteristic of the light is as follows: Four quick flashes, dark interval 3 seconds; five quick flashes, dark interval 16 seconds.

NOTE.—In order to give mariners due notice of this important change in characteristics from the former light the exhibition of the new light was deferred until August 15, 1895.

This may be regarded as a model light-station.

The grounds have been improved as far as is now practicable, Bermuda-grass roots having been set out to form a lawn and hold the sand in place. A telephone apparatus has been installed, with connections to Cape Charles City, Va., by way of the signal-service wire, which will prove of great advantage in many respects.

The locality of this station is especially disagreeable, because of the scourge of mosquitoes, sand flies, fleas, etc., which render existence almost unbearable for nearly half the year. Effort has therefore been made in the design of the station to mitigate the undesirable conditions as far as possible.

Capt. Eric Bergland, Corps of Engineers, United States Army, then engineer of the Fifth light-house district, under whose direction this iron tower was erected, made a report to the Board on the subject, which is subjoined.

The light at Cape Charles, on Smith Island, seacoast of Virginia, was originally established in 1827. The rebuilding of the station which the new one now replaces was commenced in 1858 and completed in 1864.

The present rebuilding was necessitated by the steady advance of the ocean's high-water line, which at length threatened the safety of the tower, and invaded the quarters of the light keepers during easterly storms of considerable intensity or duration. An attempt was made in 1887 to protect the station from the encroachments of the sea by a protection wall along the shore front of the site and by a jetty 130 feet long by 40 feet wide, both built of stone laid on brush; and again in 1889 by a series of jetties running at right angles with the shore line, which were constructed of rows of wooden piles, 5 feet apart, with the interspaces filled with stone. Between 1883 and the latter date, the advance of the water line had been 240 feet—an average of 40 feet per year.

It soon became evident that such protective measures simply postponed the inevitable result. At periods of unusually high tides the sea washed over the protection wall, and the retreat of the shore line being general and not local, any project of defense to be effective must be

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extensive, and hence would involve greater expenditure than the establishment of the station on a new site sufficiently remote from the old one to be beyond any danger from erosion, while at the same time affording practically as effective a position for serving the needs of navigation.

Accordingly, in the Board's annual reports for 1889 and 1890 recommendation was made that an appropriation of \$150,000 be granted by Congress for the purpose of building a new light-station where it would not be exposed to danger. This amount was appropriated by act approved August 30, 1890. A location was selected nearly a mile in a westerly direction from the old site, and on February 13, 1891, the engineer of the district proposed that the new tower be built of iron and of the same design as that at Cape Henry, Virginia, erected in 1881. This is a conical structure, built of iron plates, and seemed to adapt itself to the requirement of rapid erection at the site, which is a necessity because of the short working season there. The Light-House Board, however, at its session on April 11, 1892, selected for the purpose a tower similar to that at Waackaack, New Jersey, or Southwest Pass, Louisiana, which, besides being much less expensive, it considered would be so different in appearance from the Cape Henry tower as to prevent any chance of its being mistaken by mariners for that light-house. It would also admit of a quick setting-up of the parts at the site.

The plans and specifications were prepared in the office of the Board. They were printed in April, 1893, and bids from iron manufacturers were received in May to furnish the metal work and deliver and erect at the respective sites, the towers for this and the Hog Island light-stations, it having been found desirable, for economical and other reasons, to have both towers identical and manufactured under the one contract.

The construction of the tower was begun at the contractor's shops in June, 1893. The first series of the ironwork, 27 feet in height of tower, was finished in November, 1893; the second series, 52 feet in height of tower, in January, 1894; the third, 75 feet in height of tower, in February; the fourth and fifth, 115 feet 9 inches of total height, in March; the sixth and seventh, 149 feet 6 inches of total height, in May, and the eighth (or last) series, 192 feet 7 inches total height, including the lantern, in August. Each series was completely erected separately, and after inspection by the agent of the Light-House Board, was taken apart and removed, in readiness for shipment to the site.

Meanwhile the preparation of the foundation to receive the tower had been commenced by the engineer's working party. This work was done as follows:

After the site had been properly marked off, an iron caisson, 21 feet in diameter, built of three-eighth-inch boiler iron, was erected in the center of the foundation area. The sand was excavated from the inside,



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the caisson sinking of its own weight as the digging progressed and being kept free of water by means of a Knowles pump. When the required depth of 10 feet was reached the bottom was leveled and the wooden mold, 14 feet square, for shaping the center pier, which supports the cylinder or stairway shaft of the tower, was lowered into position inside the caisson and the deposition of the concrete begun. This concrete was composed of one part imported Portland cement, two parts of sand, and six parts of broken stone. It was put in in layers about 6 inches thick and well rammed. When set, this formed a concrete block 14 feet square and 10 feet high, except at the corners, which were molded off to form an octagon at the top.

While this pier was in course of construction a second caisson was erected at the site of one of the perimeter piers, the centers of which lie at the outer ends of eight radii, extending 26 feet 6 inches from the center of the foundation area. Excavation for this pier was made in the same way as for the central pier, but the concrete was put in the molds in three layers, the lower being 12 feet square and 3 feet 9 inches high, the second 9 feet 8 inches square and of the same height, and the third octagonal in shape (the diameter of inscribed circle being 7 feet 4 inches) and the height 2 feet 6 inches. The same process was repeated with each of the other seven perimeter piers. The anchor bolts for the outer columns were set in place while these piers were being formed. Three small piers, also of concrete, were then constructed in a similar manner (except that no caisson was used), for supporting the entrance steps and platform leading into the central shaft of the tower. After the piers had been finished all cavities were filled and the foundation area was leveled to within a foot of the tops of the piers. Tip caps for protecting the anchor bolts from the weather were placed over them, and the concrete was left to set, pending the erection of the ironwork.

Work on the foundation was commenced in January, 1894, and completed in March, 1894.

The contractors commenced the erection of the tower in June, 1894, putting up during the month four sections of columns, stair cylinder, struts, tension rods, two sections of steel lining of cylinder, one section of stairs, and the first section of elevator guides.

In July three sections of columns and stair cylinder, two sets of struts and tension rods, three sections of steel lining, four of stairway, elevator guides and pipe for the clock weights, the vestibule platform, and the entrance steps were placed in position. Work was discontinued on the 20th because of lack of material, the remaining part of the work being still at the contractor's shops in Tacony, Pa.

On October 23 they resumed operations at the site, putting up during the month the railings for the entrance steps and platform and for the cylinder stairway, the architrave, the steel lining in the sixth and seventh series of cylinder, the service-room wall and floor plates, the

### Fifth District.

tension rods in the seventh series, the watch-room floor plates, the gallery brackets, and the gallery floor plates.

During November there were erected the lantern, lantern roof, gallery railings, outside stovepipe, lining in roof, service-room and watch-room stairs and door jambs, zinc lining in dome, and steel lining in watch room. The elevator was finished, the lantern glass set, the window sashes hung in the vestibule and stair cylinder. In short, the metal work was completed, except the spider frame and the tin cone of the lantern series. The final coat of red lead was laid on the exterior and interior of the tower, one coat of white paint on the outside of tower, and two coats of white on the interior of the stair cylinder.

During December the spider frame and tin cone were erected, the wood floor and lining of the service room laid, two coats of white paint put on the exterior of the tower and one coat on the interior, three coats of brown paint on the exterior and interior of stairway on outside platform floor, watch room, and gallery floors and floor of the lantern gallery. This completed the structure on the 21st of the month.

On June 17, 1895, the lens which had been sent to Baltimore from the general depot at Tompkinsville, N. Y., was taken to the station by the tender *Jessamine*. A hoisting engine was set up, a mast erected on the watch-room gallery, with the necessary pulleys and rigging, and the parts of the lens apparatus were hoisted outside the tower into the lantern, where they were properly arranged by the lampists. Everything was in place and the machinery satisfactorily working by the 28th. On that night curtains were hung on one side of the lantern to obscure the light seaward, the lamp was lighted, and the clockwork put in motion. The light was observed from the deck of the tender at anchor in Magothy Bay, and it seemed to be satisfactory in every respect.

This apparatus is of the first order. The lens is about 12 feet high and 6 feet in diameter. It represents the first adoption of the Mahan system in a first-order light. The lens makes a revolution in 30 seconds, flashing nine times during this period, as follows:

Four quick successive flashes at intervals of about  $1\frac{1}{2}$  seconds, then a dark interval of about  $2\frac{3}{4}$  seconds; then five quick successive flashes at intervals of about  $1\frac{1}{2}$  seconds, then a dark interval of about 16 seconds. Thus the number 45 is indicated by flashes of light, as in some places the number of a fire-alarm box is designated by strokes of a bell. By this method the light is identified absolutely. The number is repeated at every revolution of the lens, and this is accomplished at such short intervals that there is no difficulty or delay in verifying the count.

464. *Wolf Trap, on a shoal between York and Rappahannock rivers, Chesapeake Bay, Virginia.*—At the beginning of the last fiscal year, July 1, 1894, the substructure or foundation pier was completed and the materials for the superstructure were being loaded on barges at the Lazaretto depot for transportation to the site. On July 10, 1894, these

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barges left the depot in tow of the tenders *Jessamine* and *Thistle* and arrived at the site on the next day. The work of erecting the brick dwelling was carried on as rapidly as possible in the limited space which the foundation pier afforded. The superstructure was ready for the exhibition of the light by the middle of September, 1894, though the light-house was not completed until two weeks later. The exterior painting, deferred until the danger from discoloration by alkali in the cement shall have passed, yet remains to be done. The new light, a fixed white varied by a white flash every 10 seconds, was shown for the first time on September 20, 1894.

In February, 1895, complaint having been made that the light was indistinct, the lens machinery was so adjusted as to produce flashes at intervals of 25 seconds. A second-class Daboll trumpet, operated by a Grob petroleum engine, sounds during thick or foggy weather blasts of 3 seconds' duration at intervals of 7 seconds. In case the trumpet should be disabled, a bell will be struck by hand. In November, 1894, about 300 tons of riprap stone were deposited around the light-house to prevent scour.

Light-vessel No. 46 marked this station on July 1, 1894, the beginning of the fiscal year, and she remained on the station until September 20, 1894, when the new light went into operation.

466. *Bowlers Rock, Rappahannock River, Virginia.*—This is one of the older screw-pile light-houses. It stands low in the water and the iron foundation suffered somewhat from the impact of the ice during the past winter. Its age and position render doubtful its ability to withstand without protection another similar experience, and it was accordingly considered prudent to place masses of heavy riprap stone in the axis of the current to act as ice breakers. Arrangements were made to this end, and the stone will be placed in position during July, 1895.

— *Beacon lights on Rappahannock River, Virginia.*—The following statement in effect was made in the Board's last two annual reports:

The trade on this river is growing rapidly. At certain seasons of the year ten or more large steamers make weekly trips here, carrying vegetables, fruits, and the like. As the river is inadequately lighted, these steamers with their perishable freight often have to tie up at night for the lack of guiding lights. The Board recommends the establishment of a red light to be at the entrance to Carters Creek, at a cost not exceeding \$3,000, and of three beacon lights, one on or near Sharp's wharf, below Suggestt Point, one on Tappahannock wharf, and one on Taylor's wharf, at an estimated cost of \$100 each. Recommendation is made that \$3,300 be appropriated for this purpose.

473. *Smith Point, mouth of Potomac River, Virginia.*—This light-house was carried away by ice on February 14, 1895. The illuminating and fog-bell apparatus, some oil, and a few small articles of supply were recovered from the wreck and stored at the Lazaretto light-house depot. By act approved March 2, 1895, an appropriation was made of \$25,000, and contract authorized to an amount not exceeding \$80,000 for the reestablishment of this light-house. Borings were made, the kind of

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structure was determined upon, and the preparation of the plans was begun. The locality is temporarily marked by a light-vessel. It is recommended that an appropriation of \$55,000, the balance of the amount estimated as needed, be made to satisfy the contracts entered into and to finish the light-station.

*474. Point Lookout, entrance to Potomac River, Maryland.*—An iron oil house was erected. Various repairs were made.

*476. Blakistone Island, Potomac River, Maryland.*—The erosion of the water front has continued. Some means of protection will have to be provided.

*478. Lower Cedar Point, Potomac River, Maryland.*—Congress, by act approved March 2, 1895, appropriated \$25,000 for reestablishing this station and authorized a contract therefor to the amount of \$75,000.

The Board is now of opinion that a superstructure can be erected on the iron piles which sustained the burned light-house, and that it can be built for a sum well within the \$25,000 already appropriated. No further appropriation for this purpose will be needed.

*485. Solomons Lump, Kedge Straits, Chesapeake Bay, Maryland.*—The preparation of the plans and specifications for a caisson structure, to replace the pile light-house carried away by ice during the winter of 1892-93, was completed in August, 1894, and proposals were invited for the two classes of work included in the specifications: (1) The furnishing and delivering at Baltimore, Md., of the metal work required, and (2) the erection of the light-house at the site. The lowest bids were accepted and contracts were made.

On April 1, 1895, the contractor for the erection began his preparations at the Lazaretto light-house depot, and on April 26, 1895, the caisson was successfully launched. On the same day the first course of cylinder plates was placed. The requisite braces were then set, concrete filling to a depth of 22 inches was put in to secure proper towing trim, and the structure was ready to be transported to the site. On May 18, 1895, the contractor's party, with a barge and three lighters loaded with material, working plant, etc., and towed, together with the caisson, by two tugs, left Baltimore for the site, and on May 19 arrived there. The caisson was anchored in position at 9 a. m. on May 20, and the work of sinking was begun. On May 31 it had reached its proper depth, but was somewhat out of level. Attempts were made to bring the structure to an even bearing, and with success, but not until it had sunk about 2 feet 6 inches below the specified depth. An additional section of cylinder was procured in order to give the structure its proper height above water level. Concrete was filled in to about 6 feet above high-water line, the cellar and cisterns were constructed, and on June 30, 1895, the foundation cylinder was completed and the erection of the superstructure was begun.

NOTE.—The station was lighted for the first time on the night of September 30, 1895.

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489. *Cedar Point, mouth of Patuxent River, Chesapeake Bay, Maryland.*—Plans and estimates for the structures were made and adopted. Proper measures are being taken to have them built by contract.

499. *Baltimore light and fog signal, Patapsco River, Chesapeake Bay, Maryland.*—Borings made at the new site selected for this light-house have shown that there is a layer of soft mud extending 55 feet below the surface of the shoal. Immediately below this is a stratum of sand which will afford a proper foundation for a light-house. The great depth to which a structure will have to be sunk makes the problem of erecting a light-house within the limits of the amount, appropriated by Congress, \$60,000, somewhat difficult. Several projects were considered and rejected, but it is hoped that a satisfactory solution will soon be found.

504. *Cutoff Channel range (rear), Patapsco River, Maryland.*—An iron oil house, with a capacity for 55 five-gallon cans, was erected. Minor repairs were made.

508. *Lazaretto Point, Baltimore Harbor, Maryland.*—The work of grading the light-house premises, so as to divert drainage from neighboring property, was completed in October, 1894.

509. *Pooles Island, off the mouth of Gunpowder River, Chesapeake Bay, Maryland.*—In October, 1894, a frame storehouse was built, a new drive well was sunk to a depth of 38 feet and a pitcher pump was attached, 744 running feet of new fence were built, and 300 running feet of new plank walk were laid. Various repairs were made.

510. *Turkey Point, head of Chesapeake Bay, Maryland.*—Wire rope was supplied for the fog-bell machine. The stable, wood shed, and smoke-house were rebuilt, and some 900 running feet of fencing were renewed.

515. *Currituck Beach, seacoast of North Carolina.*—An oil house, made of sheet iron in such a manner as to be easily taken apart and put together again, was purchased and will soon be erected.

516. *Bodie Island, seacoast of North Carolina.*—A sheet-iron oil house will be erected.

519. *Outer Diamond Shoals, off Cape Hatteras, North Carolina.*—The iron boring frame placed on the Outer Shoals in May, 1894, has stood throughout the year. In March it was examined by Mr. Julius E. Rettig, superintendent of construction, who designed the structure and had immediate supervision of its construction and erection and of towing it to the site and placing it. Through the courtesy of Mr. Kimball, General Superintendent of the Life-Saving Service, two life-saving boats and crews from the Cape Hatteras and Creed Hill life-saving stations accompanied Mr. Rettig out to the boring frame and assisted him in the examination. Mr. Rettig reported that the structure had been considerably damaged, but that there was no settlement and no evidence of scour or marked changes in the bottom at the locality. The keeper at Cape Hatteras light-station has been furnished with a

**Fifth District.**

telescope to enable him to observe the structure. He reports its condition monthly, and in his last report states that its condition remains unchanged.

The study of the problem of establishing a permanent structure at this place and the preparation of the plans therefor have been continued.

521. *Cape Lookout, seacoast of North Carolina.*—An iron oil house will be erected here at an early day.

522–532. *Beacon lights in North Landing River, Virginia, and Currituck Sound and North River, North Carolina.*—At beacon No. 8, Long Point, North Carolina, the facing of the wharf and top pieces are much decayed and require renewing. The foundation of the boathouse needs strengthening, and additional means should be taken to prevent the earth from caving in and obstructing the slip. On June 21, 1895, beacon No. 9, North River, was overturned by a passing vessel. The light will be reestablished as soon as practicable.

549. *Brant Island Shoal, Pamlico Sound, North Carolina.*—A new water tank of 200 gallons' capacity was supplied in January, 1895.

**REPAIRS.**

Repairs, more or less extensive, were made during the year at the following-named stations:

438. Cape Henry, Va.	502. Seven-Foot Knoll, Md.
440. Old Point Comfort, Va.	506. Hawkins Point, Md.
450, 451. Dutch Gap Cutoff, Va.	507. Leading Point, Md.
454. Old Plantation Flats, Va.	512. Havre de Grace, Md.
455. Cherrystone, Va.	517. Cape Hatteras, N. C.
465. Stingray Point, Va.	520. Ocracoke, N. C.
467. Windmill Point, Va.	538, 539. Edenton Harbor range, N. C.
475. Piney Point, Md.	541. Croatan, N. C.
480. Upper Cedar Point, Md.	542. Roanoke Marshes, N. C.
488. Hooper Strait, Md.	545. Gull Shoal, N. C.
490. Drum Point, Md.	546. Southwest Point Royal Shoal, N. C.
496. Greenbury Point Shoal, Md.	547. Northwest Point Royal Shoal, N. C.
497. Sandy Point, Md.	550. Pamlico Point, N. C.

**WORKING PLANT.**

In October, 1894, the small scow used for transporting materials for construction and repairs was practically rebuilt. The large scow was also overhauled.

**FOURTH-ORDER LAMPS.**

At 29 of the 40 fourth-order light-stations in the district Funck-Heap lamps were substituted for the Hains lamps, heretofore in use. Most of these changes were made during the year just ended.

**Fifth District.****LIGHT-VESSELS.**

436. *Cape Charles light-vessel, No. 49, entrance to Chesapeake Bay, Virginia.*—This vessel is in good condition. In a heavy gale on September 27, 1894, she parted her chains and lost her anchors, but was safely brought into port by her master. After these deficiencies were supplied she was replaced on her station on October 4, 1894, and is still there.

441. *Bush Bluff light-vessel, entrance to Norfolk, Elizabeth River, Virginia.*—The old steam tender *Holly* has been utilized for a greater part of the year as a light-vessel, and has been used at this station. She was carried away on February 14, 1895, by floating ice, and on February 18 she was replaced by the schooner *Drift*. On March 5, 1895, the *Holly* relieved the *Drift* and is still on the station.

— *Light-vessel No. 46.*—This vessel is now stationed off Smith Point, Virginia, at the mouth of the Potomac River, in the place of Smith Point light-house, which was carried away by ice February 14, 1895. Before going on this station two quick-steaming boilers were installed, and certain general repairs were made. She is efficient, and is kept in good condition.

— *Cape Lookout Shoals light-vessel, North Carolina.*—The following recommendation, made in the Board's last three annual reports, is renewed:

Cape Lookout Shoals extend 8 miles beyond the point of the cape. There are dangerous breakers on the shoals 5 miles from the cape. When a vessel drawing more than 15 feet of water has made sufficient offing to just clear these shoals, she is 10 miles distant from the Cape Lookout light. Although this light is of the first order, shown from a tower 150 feet high, and should be seen a distance of 18 miles under favorable circumstances, it may happen during thick or hazy weather that a mariner may fail to see it in time to avoid that line of shoals. A light-ship of the improved model now constructed for use at exposed stations and provided with a steam fog signal, to cost \$70,000, approximately, would be a valuable aid to navigation, if placed near the southern extremity of the shoals. It is therefore recommended that an appropriation of that amount be made therefor.

**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

436. *Cape Charles light-vessel, No. 49, entrance to Chesapeake Bay, Virginia.*—This 12-inch steam whistle was in operation some 346 hours during the year, and consumed about 27 tons of coal.

— *Light-ship No. 46.*—This 12-inch steam whistle was in operation 39 hours from July 1 to September 30, 1894, and from June 10 to June 30, 1895, and consumed about 3 tons of coal.

438. *Cape Henry, entrance to Chesapeake Bay, Virginia.*—This first-class steam siren, in duplicate, was in operation some 342 hours during the year, and consumed about 22 tons of coal.

464. *Wolf Trap, Chesapeake Bay, Virginia.*—This second-class Daboll trumpet was in operation some 124 hours from February 1 to June 30, 1895, and consumed about 57 gallons of mineral oil.

**Fifth District.****DAY OR UNLIGHTED BEACONS.**

There are ten of these beacons in this district, most of which are in good order.

**BUOYAGE.**

The buoyage of the district has been efficiently maintained throughout the year by the tenders *Maple* and *Violet*, and is now in good condition. The small iron buoys inside the bar at Bogue Inlet, North Carolina, have been in position during the year and give satisfaction. A local pilot is employed to care for them. The stakes in Core Sound have been renewed by contract, under the supervision of the buoy master for North Carolina sounds. Owing to the heavy ice during the past winter, many buoys and appendages were carried away, but most of them were subsequently recovered by the tenders.

**DEPOTS.**

*Lazaretto Point, Baltimore, Md.*—Door and window screens were provided for the custodian's quarters in July, 1894. The depot is in good condition, except the wharf, which requires considerable repair. The recommendation made in the last five annual reports with reference thereto is repeated:

Attention is invited to the necessity of providing a dwelling at this depot for the accommodation of the depot keeper and his family. Their quarters in the warehouse are unsuitable and uncomfortable, and, even were the rooms not required for other purposes, it would cost nearly as much to make them comfortably habitable as it would to build a new dwelling. About one-third of the space on the upper floor is reserved for the use of custom-house inspectors, and the large and increasing amount of work on hand in the district demands the use of all storage and shop room available. The depot keeper must be constantly on the spot, and can not live away from the premises. There is ample room on the Government tract for such a building as is required, and it can be built for \$2,500. An appropriation of this amount is earnestly recommended.

*Point Lookout, Maryland.*—The old part of the wharf requires repair; the decking, some of the piles, and the fender posts should be renewed. Tugs frequently tie up at the wharf during the night in order to seek tows in the morning, and this practice results in injury to the wharf and fender piles, the metal being chafed off and the wood exposed to the action of the shipworm.

*Portsmouth, Va.*—This depot is in fair condition. The purchase, in 1892, of additional land for the purpose of increasing the wharf and storage facilities, has resulted in nothing, as no appropriation was made for the necessary improvements, which include the extension of the wharf and the putting of the depot in thorough order. It is now a vacant lot, the resort of idle boys, and a source of care and annoyance to the custodian.



**Fifth District.**

The Board is now of opinion that the needed repairs can be made for, say, \$15,000, and it is recommended that an appropriation of this amount be made therefor.

*Washington, N. C.*—A contract was made for the repair of the wharf and the rebuilding of the fences. The work will soon be begun.

**TENDERS.**

*The Maple.*—This steel, twin-screw steamer was in service during the whole year. She steamed some 15,985 miles and consumed about 1,264 tons of coal. Fires were hauled from under her boilers for 35 days; she cleaned and painted 850 buoys and recovered 76 buoys; made 250 visits to light-stations; delivered 310 tons of coal and 130 cords of wood, and left rations at 48 light-stations. The crew was employed 90 days in cleaning and painting buoys at the depots. The *Maple* was employed 22 days in towing and attending to light-vessels Nos. 46 and 49, the schooner *Drift*, and the tender *Holly*, on Wolf Trap, Smith Point, Cape Charles, and Bush Bluff stations.

*The Violet.*—This wooden side-wheel steamer was laid up undergoing repairs from July 1 to September 30, 1894. She was supplied with a new boiler, the engine was thoroughly overhauled and lined up, the brasses were renewed, the wooden berths in the wardroom and fore-castle were replaced with iron ones, the forward deck was sheathed, the joiner work outside was renewed, together with the guard facing, and seven new knees were placed under the guard forward. The canvas on the upper deck was renewed and two new staterooms were built aft. A new rudder and a steam steerer, and a new floor in the pilot house were supplied, and various other repairs were made. From October 1, 1894, to June 30, 1895, the *Violet* steamed 10,460 miles, consumed about 560 tons of coal, delivered fuel at 21 light-stations, delivered annual supplies at 18 light-houses in North Carolina, made 204 visits to lights for inspection and supply, worked 362 buoys, and the crew worked 14 days at depots painting and cleaning buoys.

*The Bramble.*—This steel, twin-screw steam launch is used to supply gas to the beacons in Currituck Sound. In the performance of this work she steamed some 1,635 miles, and consumed about 31 tons of coal.

*The Jessamine.*—This iron, side-wheel steamer was employed in the construction of Wolf Trap, Cape Charles, and Hog Island light-houses; in putting up the fog-signal machinery at Wolf Trap and the lens apparatus at Cape Charles light-stations; in making borings at the sites of the proposed light-houses for Baltimore entrance, Point No Point, Swan Point Bar, and Smith Point, and of the day beacon for Tobago Middle Ground; in accurately marking out the location of the new Solomons Lump light-house; in the repairs of 10 light-stations, and in the inspection, with a view to ascertaining the repairs needed, of 26 others. While employed in this work she steamed some 6,213 miles

**Fifth District.**

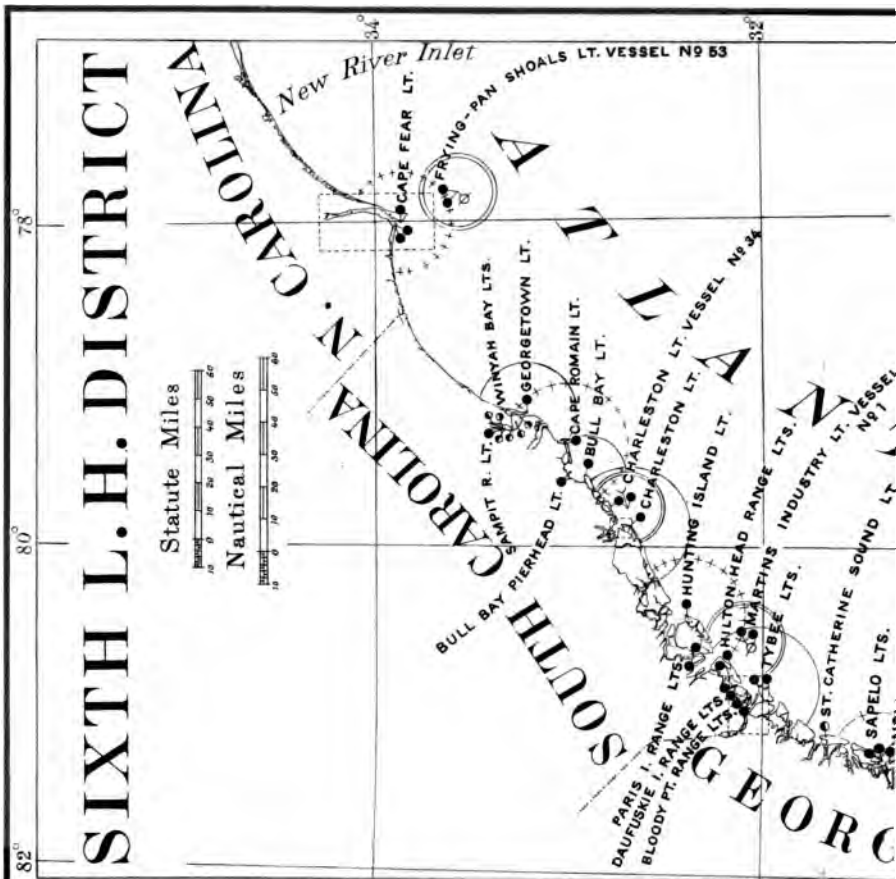
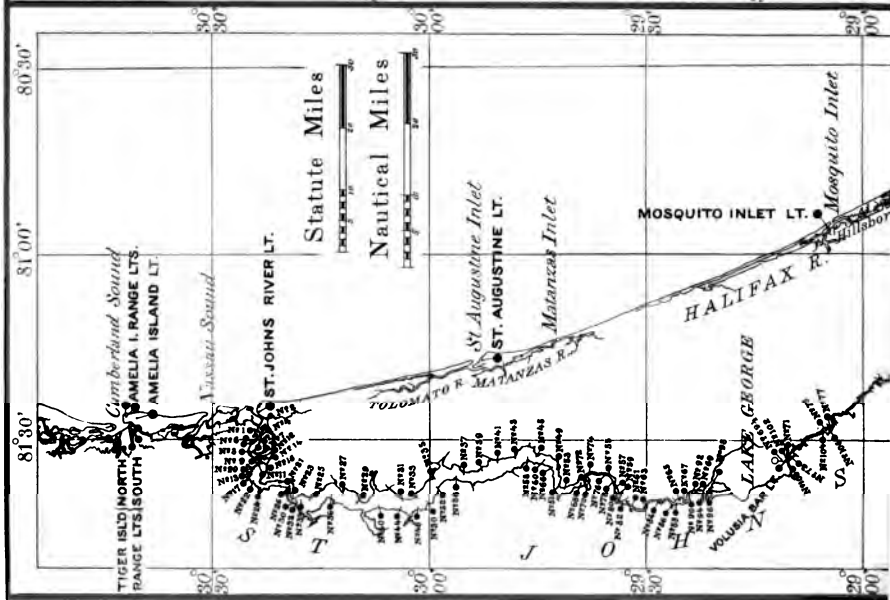
and consumed about 520 tons of coal. In September, 1894, and June, 1895, she was hauled out on a marine railway, when her hull was scraped and painted. Between January 31 and February 18, 1895, her keel was repaired, and from February 27 to May 2, 1895, she was laid up to receive extensive repairs to her woodwork, much of it being entirely renewed.

*The Thistle.*—This wooden, screw, steam tug was used principally in towing materials for the construction of Cape Charles and Hog Island light-stations and in attendance on the work there. She assisted in the repairs made at Hawkins Point and Pooles Island light-stations, and in the driving of a test pile at the site of Baltimore light-house. She inspected the Cutoff Channel rear beacon and Leading Point, Fort Carroll, and Long Point light-stations. During the year she steamed some 7,960 miles, with a consumption of about 224 tons of coal. Her boiler was repaired in October, 1894, and from May 24 to June 2, 1895, her condenser was being renewed and her boiler and engine were being repaired.

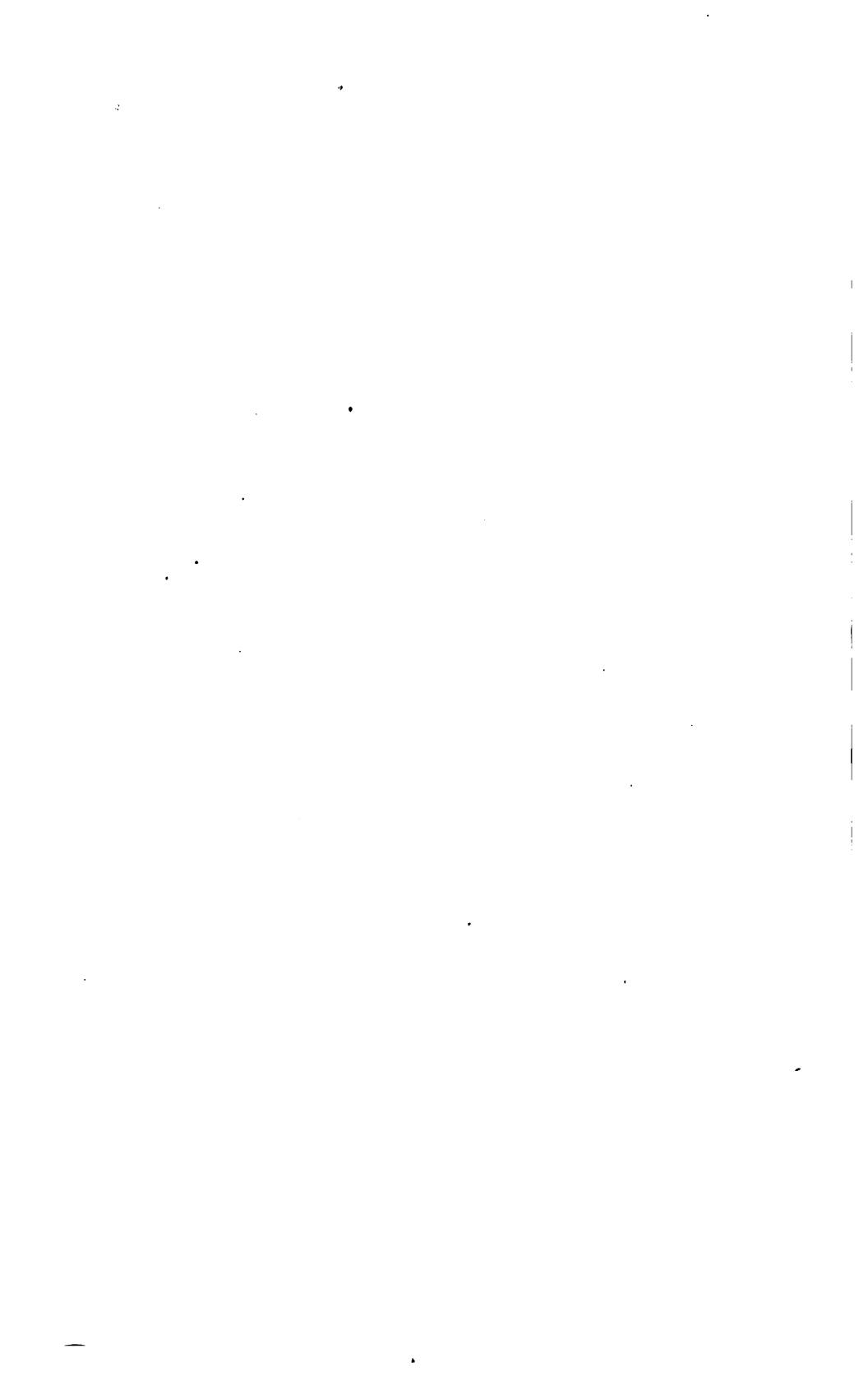
*Tender Holly.*—This old iron side-wheel steamer was used for part of the past year as a relief light-vessel and is still stationed off Bush Bluff Shoal, Elizabeth River, entrance to the port of Norfolk, Va., in that capacity.

*Schooner Drift.*—This vessel, which was borrowed from the Coast Survey, is used as a relief light-vessel in Chesapeake Bay. She is laid up at the Portsmouth, Va., buoy depot when not employed.









## SIXTH DISTRICT.

This district extends from but does not include New River Inlet, North Carolina, to and including Jupiter Inlet light-station, Florida. It embraces all aids to navigation on the seacoast, bays, sounds, harbors, rivers, and other tidal waters of North Carolina, South Carolina, Georgia, and Florida between the limits named.

*Inspector*.—Commander M. R. S. Mackenzie, United States Navy.

*Engineer*.—Capt. Eric Bergland, Corps of Engineers, United States Army.

In this district there are—

Light-houses and beacon lights, including 137 post lights.....	205
Light-ships in position.....	3
Day or unlighted beacons.....	50
Fog signals operated by steam.....	2
Fog signals operated by clockwork.....	3
Whistling buoys in position.....	6
Bell buoys in position.....	15
Other buoys in position.....	298
Steamer <i>Wistaria</i> , buoy tender and for inspection and supply.....	1
Schooner <i>Pharos</i> , for construction and repair.....	1

## LIGHT-HOUSES.

— *Cape Fear, seacoast of North Carolina*.—The following statement, which was made in the Board's last six annual reports, is renewed :

The shoals forming the continuation of this cape for about 18 miles to the south-east are dreaded by shipmasters only a little less than those at Cape Hatteras. At present a light-ship near the outer extremity of the shoals warns vessels of danger and gives them a good point of departure. This aid to navigation can not be dispensed with; but it is not sufficient to insure adequate protection to the large number of domestic and foreign vessels attracted to this point by the considerable and increasing trade of the neighboring port of Wilmington, N. C., because of the small area lighted by it, and because of its liability to be set adrift from its moorings during heavy storms, which is the very time when its light is most needed. The present Cape Fear light (Bald Head), on account of its inland position and want of height, does not cover the shoal, and therefore does not give sufficient warning to vessels when the light-ship may have drifted from her moorings. A first-order light-house built on the pitch of Cape Fear, with a radius of  $18\frac{1}{2}$  miles of light, would be seen so far as to give timely warning, and the fact of being near enough to the coast to see it would be a sufficient indication that the observer should make a better offing. Other reasons for a first-order light-house here may be found in the better protection it would afford to the bight lying north of the cape, which has been left dark since the discontinuance of Federal Point light-station in 1880. The proposed

**Fifth District.**

telescope to enable him to observe the structure. He reports its condition monthly, and in his last report states that its condition remains unchanged.

The study of the problem of establishing a permanent structure at this place and the preparation of the plans therefor have been continued.

521. *Cape Lookout, seacoast of North Carolina.*—An iron oil house will be erected here at an early day.

522–532. *Beacon lights in North Landing River, Virginia, and Currituck Sound and North River, North Carolina.*—At beacon No. 8, Long Point, North Carolina, the facing of the wharf and top pieces are much decayed and require renewing. The foundation of the boathouse needs strengthening, and additional means should be taken to prevent the earth from caving in and obstructing the slip. On June 21, 1895, beacon No. 9, North River, was overturned by a passing vessel. The light will be reestablished as soon as practicable.

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**REPAIRS.**

Repairs, more or less extensive, were made during the year at the following-named stations:

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496. Greenbury Point Shoal, Md.

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**WORKING PLANT.**

In October, 1894, the small scow used for transporting materials for construction and repairs was practically rebuilt. The large scow was also overhauled.

**FOURTH-ORDER LAMPS.**

At 29 of the 40 fourth-order light-stations in the district Funck-Heap lamps were substituted for the Hains lamps, heretofore in use. Most of these changes were made during the year just ended.



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**Sixth District.**

619, 620. *Venus Point range, Savannah River, South Carolina.*—This range was discontinued by the extinguishment of the light of its front beacon. A Funck lantern will be substituted for the present locomotive reflector of the rear beacon when the ranges for the new channel into the Savannah River, Georgia, are lighted.

633. *St. Catherines Sound, seacoast of Georgia.*—In accordance with the act approved March 3, 1893, for the establishment of a fourth-order light-house on this sound, a site was selected on St. Catherines Island, Georgia, and an effort was made to purchase the land required for it at a reasonable rate. Failing in this effort, proceedings in condemnation were instituted to obtain title, but the order was suspended upon application of the owner of the land, who asked that an examination of Ossabaw Island, Georgia, be made to determine whether a site could not be found there which would serve as well as the site selected on St. Catherines Island. The examination was made, but proved futile. The owner then demanded \$50,000 for the site originally selected. This price being prohibitive, proceedings in condemnation were resumed. The hearing is expected to be had in court some time in November, 1895. Pending the settlement of title no work was done.

634, 635. *Sapelo light and beacon, entrance to Doboy Sound, Georgia.*—Some 125 running feet of plank walk were built and 200 bushels of oyster shells were placed around the foundation of the front beacon to stop the drift of sand. Extensive repairs were made.

638. *St. Simon, entrance to St. Simon Sound, Georgia.*—A new brick cistern of 6,000 gallons' capacity was built. Some 75 running feet of terra cotta drainpipe were laid. Some 1,500 running feet of new picket fence, with four gates, were built. Various repairs were made.

639. *St. Simon beacon, Georgia.*—The proceedings in condemnation for the acquirement of the site desired for this beacon, begun in 1893, resulted in a conveyance in March, 1895, approved by the Attorney General of the United States. Jurisdiction was ceded by Georgia, and in April an iron triangular skeleton structure, supported by heavy brick piers and carrying a locomotive reflector light, fixed white, with focal plane of 37 feet, was erected. It was lighted in May. This beacon, in connection with St. Simon main light, forms a range to guide through the best water on any one straight line across the bar, and gives a depth at mean low water of 12 feet.

— *The inside passage from Savannah, Ga., to Fernandina, Fla.*—In its last six annual reports the Board recommended that it be empowered to erect and maintain twenty-five post lights, in order to facilitate the navigation of the inland passage from Savannah to Fernandina, at an estimated cost of \$4,000, and that the appropriation for lighting of rivers be increased by that amount to permit of the establishment and maintenance of these lights. This recommendation is renewed.

**Fifth District.**

The Board is now of opinion that the needed repairs can be made for, say, \$15,000, and it is recommended that an appropriation of this amount be made therefor.

*Washington, N. C.*—A contract was made for the repair of the wharf and the rebuilding of the fences. The work will soon be begun.

**TENDERS.**

*The Maple.*—This steel, twin-screw steamer was in service during the whole year. She steamed some 15,985 miles and consumed about 1,264 tons of coal. Fires were hauled from under her boilers for 35 days; she cleaned and painted 850 buoys and recovered 76 buoys; made 250 visits to light-stations; delivered 310 tons of coal and 130 cords of wood, and left rations at 48 light-stations. The crew was employed 90 days in cleaning and painting buoys at the depots. The *Maple* was employed 22 days in towing and attending to light-vessels Nos. 46 and 49, the schooner *Drift*, and the tender *Holly*, on Wolf Trap, Smith Point, Cape Charles, and Bush Bluff stations.

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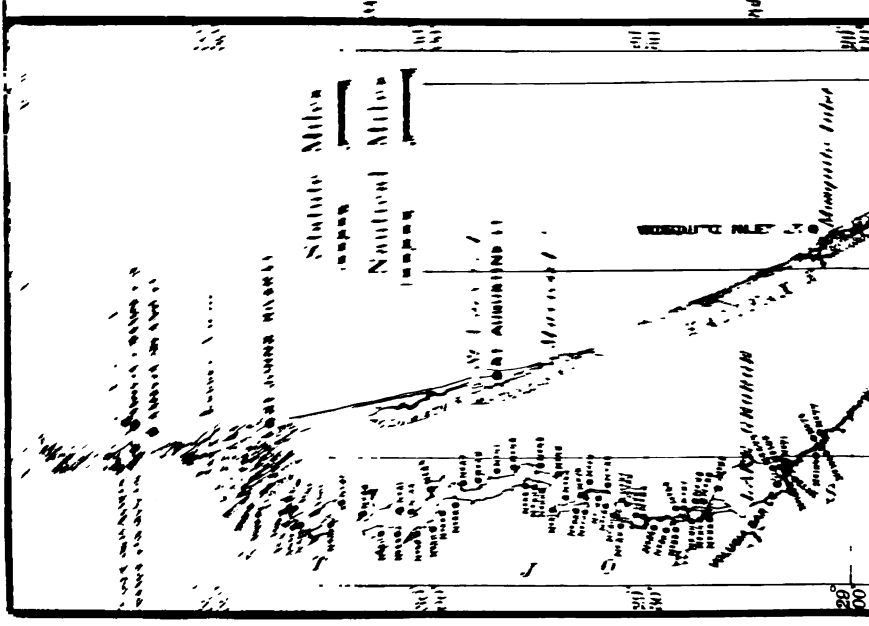
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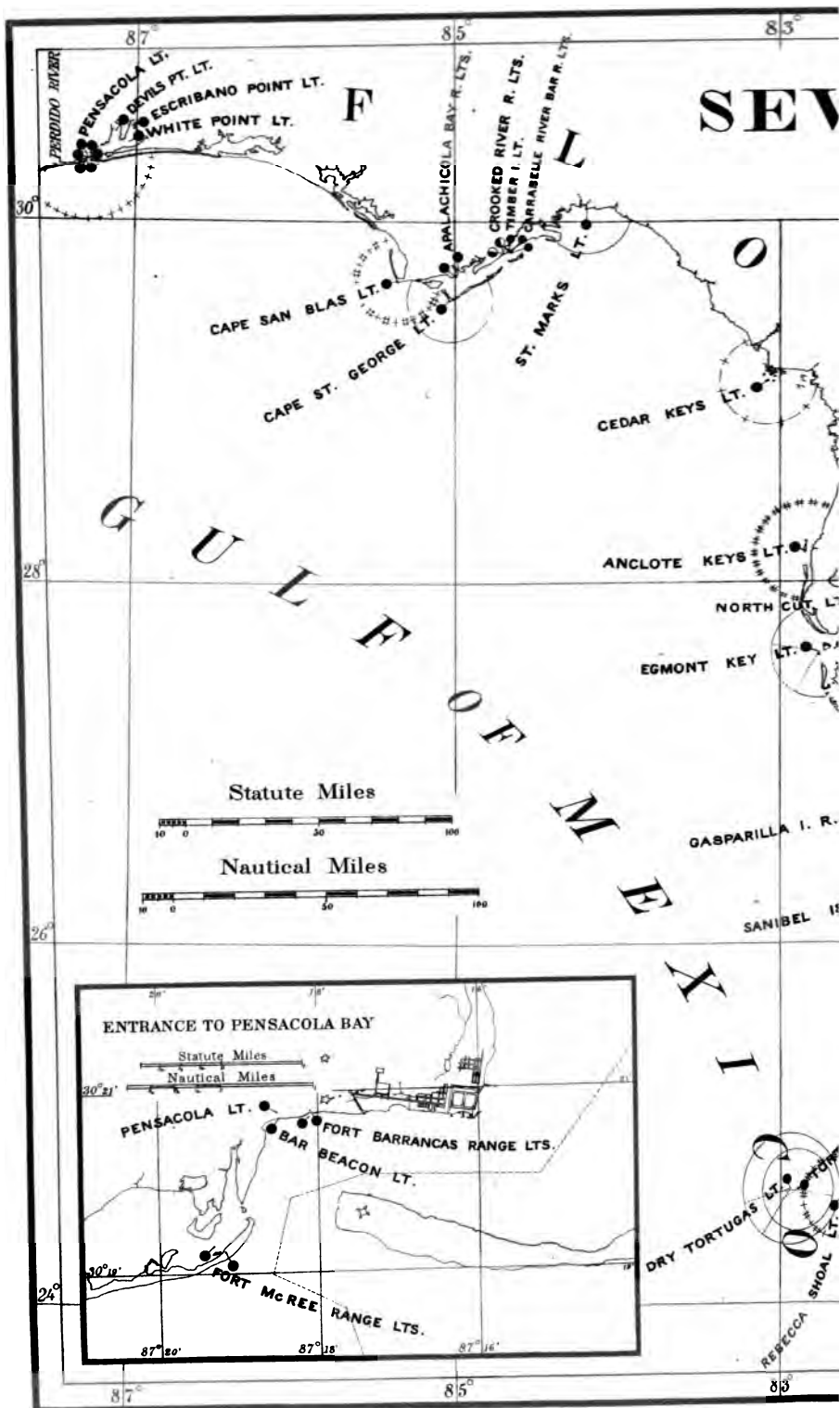


SOUTH L. H. DISTRICT

Statute Miles  
Nautical Miles









# ENTH L.H. DISTRICT

## Note

The different varieties of Lights and Fog-Signals are designated by the following characters.

- Fixed White
- Fixed Red
- ..... Flashing White.
- ..... Flashing Red.
- Fixed White varied by White Flashes.
- Fixed White varied by Red Flashes.
- Fixed White varied by Red & White Flashes.
- ..... Flashing Red & White.
- Double Lights.

☛ Lights building or to be built.

☛ Fog-Signals operated by steam or hot air.

☛ Fog Bells struck by machinery.

☛ Fog Bells struck or rung by hand.

Fog-Signals building or to be built are dotted.

The Ranges of Visibility are indicated only for some of the principal lights, others can be found in the L.H. List.

Corrected to June 30, 1895.

BARREL STAKE LT.  
MIDDLE GROUND LT.  
LONG SHOAL LT.  
SOUTH CUT LT.  
INDIAN HILL LT.  
MULLET KEY SHOAL LT.

MANGROVE PT. LT.  
PEACE CREEK LT.  
CHARLOTTE HR. LT.  
ISLAND LT.

CHUGAS HR. LT.  
NEW PASSAGE LT.  
KEY WEST LT.  
SAND KEY LT.  
AMERICAN SHOAL LT.  
SOMBREIRO KEY LT.

JUPITER INLET LT.

FOWEY ROCKS LT.

CARYSFORT REEF LT.  
ALLIGATOR REEF LT.

ATLANTIC OCEAN



## SEVENTH DISTRICT.

This district extends from a point just south of Jupiter Inlet light-station to and including Perdido Entrance, Florida. It embraces all aids to navigation on the sea and Gulf coasts of Florida, and on other tidal waters tributary to the sea and Gulf between the limits named.

*Inspector.*—Commander William B. Newman, United States Navy.

*Engineer.*—Maj. James B. Quinn, Corps of Engineers, United States Army.

There are in this district—

Light-houses and lighted beacons .....	44
Day or unlighted beacons .....	36
Whistling buoys in position .....	3
Bell buoys in position .....	5
Other buoys in position .....	256
Steamer <i>Laurel</i> , buoy tender and for supply and inspection .....	1
Steamer <i>Arbutus</i> , for construction and repair in the Seventh and Eighth districts. ....	1

## LIGHT-HOUSES.

— *Hillsboro Inlet, off Hillsboro Point, between Jupiter Inlet and Fowey Rocks lights, Atlantic coast of Florida.*—The following recommendation was made in the last ten annual reports of the Board:

The establishment of a light at or near Hillsboro Point, Florida, would be of great assistance to all vessels navigating these waters. Steamers bound southward, after making Jupiter Inlet light, hug the reef very closely to avoid the current. The dangerous reef making out from Hillsboro Inlet compels them to give it a wide berth and to go out into the Gulf Stream. Vessels coming across from the Bahama Banks would be able to verify their position if a light were placed here—a difficult matter in case they fail to make Jupiter Inlet. The establishment of this light would complete the system of lights on the Florida reefs.

The Board therefore renews the recommendation that \$90,000 be appropriated for this purpose.

771. *Key West, Key West Island, Gulf of Mexico, Florida.*—Some 550 feet of fence were put up. The work of increasing the height of the tower 20 feet was completed February 8, 1895, under contract, and the regular light was reestablished on February 5, 1895. During the progress of the work a temporary light was shown from a pole.

775. *Tortugas Harbor, on a bastion of Fort Jefferson, Garden Key, one of Tortugas group, Florida.*—Some 390 feet of iron fence were built. Extensive repairs were made.

776. *Sanibel Island, entrance to San Carlos Harbor and port of Punta Rassa, Florida.*—A second-order oil house was completed at this station under contract. Extensive repairs were made.

## Seventh District.

777. *Gasparilla Island, entrance to Charlotte Harbor, Florida.*—A second-order oil house was completed February 15, 1895, under contract. Minor repairs were made.

782. *Egmont Key, entrance to Tampa Bay, Florida.*—A second-order oil house was completed January 24, 1895, under contract. Various repairs were made.

The following recommendation, which was made in the Board's last two annual reports, is renewed:

A new dwelling is needed for the assistant light-keeper. The Board estimates that it can be built for not exceeding \$4,000, and it is recommended that an appropriation of this amount be made for that purpose.

The Board is now of the opinion that this keeper's dwelling can be erected for, say, \$3,500, and it recommends that an appropriation of this amount be made therefor.

— *Tampa Bay beacons, Florida.*—There are eleven of these beacons, seven lighted and four day beacons. They were completed in December, 1894, and mark the channels in Tampa and Hillsboro bays, Florida. The lighted beacons are of triangular iron framework resting on sleeve piles, and have Funck-Heap lamps. The beacons are designated by name as follows:

North Channel day beacon.

Southwest Channel day beacon.

Mullet Key Shoal beacon.

Indian Hill beacon.

Wreck of Steamer Cool day beacon.

South Cut beacon.

North Cut beacon.

Catfish Point Shoal day beacon.

Long Shoal beacon.

Middle Ground beacon.

Barrel Stake beacon.

Lights were first established on these beacons on January 25, 1895.

— *Tampa Bay and Manatee River beacons, Florida.*—Contracts for the erection of these beacons were made. There will be five of them. Each will be built upon a cluster of four piles with a platform and a Funck-Heap lamp.

792. *St. Marks, St. Marks River, Florida.*—A new cistern was put up. Extensive repairs were made.

793. *Crooked River, Florida.*—The erection of this station was begun in January, 1895, under contract. The material has all been delivered, and on June 30, 1895, the buildings were nearly completed.

— *Carrabelle beacons, St. George Sound, Gulf of Mexico, Florida.*—These beacons are called Front Range, Rear Range, and Timber Island. They were completed in March, 1895, and lighted in the following June. They are intended as guides in crossing the bar of Carrabelle River. Beacon No. 3, or the upper one, marks the turning point in the river by which the shoals in the harbor of Carrabelle are avoided. They are each built on a cluster of six piles, with a platform and Funck-Heap lamp.

794. *Cape St. George, near St. George Sound, Florida.*—A first-order oil house was completed in December, 1894, under contract.

**Seventh District.**

**795. *Apalachicola Bay, front beacon, on the dredged channel leading into Apalachicola Bay, Florida.***—The following recommendation, which was made in the Board's last annual report, is renewed:

This beacon was erected in 1887, and paid for from the special appropriation for Apalachicola Bay range lights, Florida. In August, 1890, the beacon was destroyed by a tug; it was rebuilt, and destroyed again by the same tug and a tow of barges in November, 1891; it was restored the second time, and was again knocked down by a tug in February, 1894. A single pile beacon was established in its place by local interested parties. From an examination of the foundation soil it is evident that it would be imprudent to erect an ordinary pile beacon. It is therefore recommended that a more substantial structure be placed there, on a pile and concrete foundation with a cylindrical concrete superstructure. It is estimated that the construction of such a beacon will cost not exceeding \$7,000, and it is recommended that an appropriation of this amount be made therefor.

**797. *Cape San Blas, Gulf of Mexico, Florida.***—A gale on October 8 and 9, 1894, badly damaged this station, extinguishing the light and wrecking the keepers' dwellings. So much of the cape was washed away that the tower now stands in the water. The light was again exhibited as usual, and temporary quarters were provided for the keepers. The removal of this station to Blacks Island, in St. Joseph Bay, was determined upon, and plans and specifications for this work are now in course of preparation.

— ***St. Joseph Point, St. Joseph Bay, Gulf coast of Florida.***—The following recommendation, which was made in the Board's annual reports for the last seven years, is renewed:

The fishing fleet on this coast is large. A southerly gale is calculated to drive these vessels upon a lee shore. The only harbor of refuge for some 60 miles is St. Joseph Bay. This is easily accessible in the daytime, but at night it is difficult of entrance without a light. The Board is decidedly of opinion that it would be largely to the interests of the fishing fleet in particular, and the commerce and navigation of the Florida coast in general, that this light should be established. It is estimated that it can be done for \$25,000. A bill for this purpose was favorably reported upon recently by the Senate Committee on Commerce, and the Senate inserted the item in the sundry civil appropriation bill, but as it failed of enactment the recommendation is renewed.

**798. *Pensacola, near Fort Barrancas, Pensacola Bay, Florida.***—A wooden curbing, 137 feet long, was built in front of the dwelling. A new foundation was placed under the cistern, 520 cubic feet of brick wall were replaced, and 526 feet of plank walk rebuilt. Other extensive repairs were made.

**800. *Fort McRee (front) beacon, Florida.***—A new 22-foot ladder was put up.

**Seventh District.****REPAIRS.**

At each of the following-named stations repairs, more or less extensive, were made during the year:

765. Fowey Rocks, Fla.  
766. Carysfort Reef, Fla.  
767. Alligator Reef, Fla.  
768. Sombbrero Key, Fla.  
769. American Shoal, Fla.  
770. Sand Key, Fla.

772. Northwest Passage, Fla.  
773. Rebecca Shoal, Fla.  
774. Dry Tortugas, Fla.  
791. Cedar Keys, Fla.  
799. Pensacola Bar beacon, Fla.  
802. Fort Barrancas (front) beacon, Fla.

**LIGHTED BEACONS.**

The number of lighted beacons in the district was increased by the establishment of seven in Tampa Bay and three in St. George Sound.

**DAY OR UNLIGHTED BEACONS.**

Beacons were established at the entrance to, and in Tampa and Hillsboro bays, Florida; one was placed on the shoals of the North and Southwest channels, one to mark the wreck of the steamer *Cool*, and one on Catfish Point Shoal. Day beacons Nos. 1 and 4, in Tampa Bay, are in an unsafe condition.

*Florida Reef beacons.*—The following recommendation, which was made in the Board's last annual report, is renewed:

Some of these beacons are down and all require extensive repairs. They are of importance as day marks, and are of great assistance in navigating along the Florida Reef, and should be restored so as to serve their original purpose. It is estimated that it will cost not to exceed \$10,000 to put them in proper repair, and it is recommended that this amount be appropriated therefor.

**BUOYAGE.**

The buoyage of the district is in good condition. Two new buoys were established, one to mark the entrance of the Swash Channel to the light-house anchorage at Key Biscayne and the other to mark the entrance over the shoal to Cocoanut Grove, Key Biscayne Bay. The following-named buoys in Tampa Bay were discontinued and day or lighted beacons took their places: Passage Key Shoal buoy, Mullet Key Shoal buoy, Wreck of *Cool* buoy, Catfish Point Shoal buoy, and Long Shoal buoy. The Charlotte Harbor and Cape Haze buoys and the buoys off Alligator River were discontinued as unnecessary. The jetty buoy, Key West Harbor, northwest channel, was temporarily discontinued while the United States engineers were at work on the extension of the jetty. It is proposed to replace it when the work is stopped for the year. In all two new buoys were placed and seven discontinued. Seven buoys went adrift, four of which were recovered, and two more will be as their locations are known. One buoy was condemned as beyond repair. The loss for the year was one buoy, a third-class can, which is supposed to have sunk.

**Seventh District.****DEPOTS.**

*Key West buoy depot and coal shed, Gulf of Mexico, Florida.*—The following recommendation, which was made in the Board's last annual report, is renewed:

This depot remains much the same as it was when reported last year. It requires extensive repairs to make it useable and to save the wharf and coal shed from complete destruction. This being a sort of halfway station in this long district, it is a very important point from which to work buoys and to send supplies in both directions, and at which light-house steam tenders can take in a supply of coal to make runs among the reef light-houses and with which to return to the main land. It is estimated that this wharf and coal shed can be put in proper repair for not exceeding \$10,000, and it is recommended that an appropriation of this amount be made therefor.

By patching the wharf with plank brought from the remains of the wharf at Tortugas Harbor the necessary buoy work has been carried on.

*Egmont Key, entrance to Tampa Bay, Gulf of Mexico, Florida.*—The following recommendation, contained in the Board's last annual report, is renewed:

This is the only light-house depot in the Seventh light-house district where fresh water can be obtained except by purchase. The buoyage of the west coast of Florida is worked from this depot, and it is highly necessary that the wharf be made a permanent structure. It is now merely a temporary structure and it will require extensive and expensive repairs if retained, owing to the ravages of the teredo and limnoria. It is estimated that it will cost not to exceed \$10,000 to make this a permanent structure, and it is recommended that an appropriation of this amount be made therefor.

*Pensacola, Fla.*—At this depot there were manufactured during the year 260 third-class, 100 first-class, and 175 second-class shackles complete; 250 third class pins and keys, 465 assorted keys, and 81 bushings. Some 70 first-class, 50 second-class, and 91 third-class shackles were repaired; 54 buoys were patched and repaired. All the tools needed by the tender for buoy work were made here. Three tubular lanterns were repaired. The new riding bitts and upper and lower guard on the starboard side of the tender were made and fitted by the depot force and many minor repairs were made to the boats and vessels.

**TENDERS.**

*The Laurel.*—This wooden twin-screw steamer was constantly employed in making the regular inspections and in the supply and buoy work of the district. Her crew cleaned and painted 299 buoys, changed 286 buoys, landed 24 cords of wood and 70 rations at light-stations. She made 101 inspection trips and her crew worked 60 days at the different depots. The tender's engineer force bushed 49 buoys and patched 13 while away from the depot shop. She was under steam 273 days and fires were hauled 92 days. In doing this work she steamed

**Seventh District.**

some 9,610 nautical miles and consumed for all purposes about 606 tons of bituminous coal. The hull of the vessel shows signs of weakness working in a seaway and makes more water at that time than when at rest in smooth water. An entire new set of riding bitts of yellow pine were made and put in by the depot force. The fender guards on the starboard side were renewed, as were several of the stanchions of the forward bulwarks, and the rail was refastened. The mainmast, from the spider band to the hurricane deck, has several large spots of dry rot. The vessel has not been out of water for nearly three years. The condition of the under-water portion of the hull can only be conjectured until the vessel is docked and examined. As far as can be seen there is some metal off and loose in the wake of the gangways for working buoys.

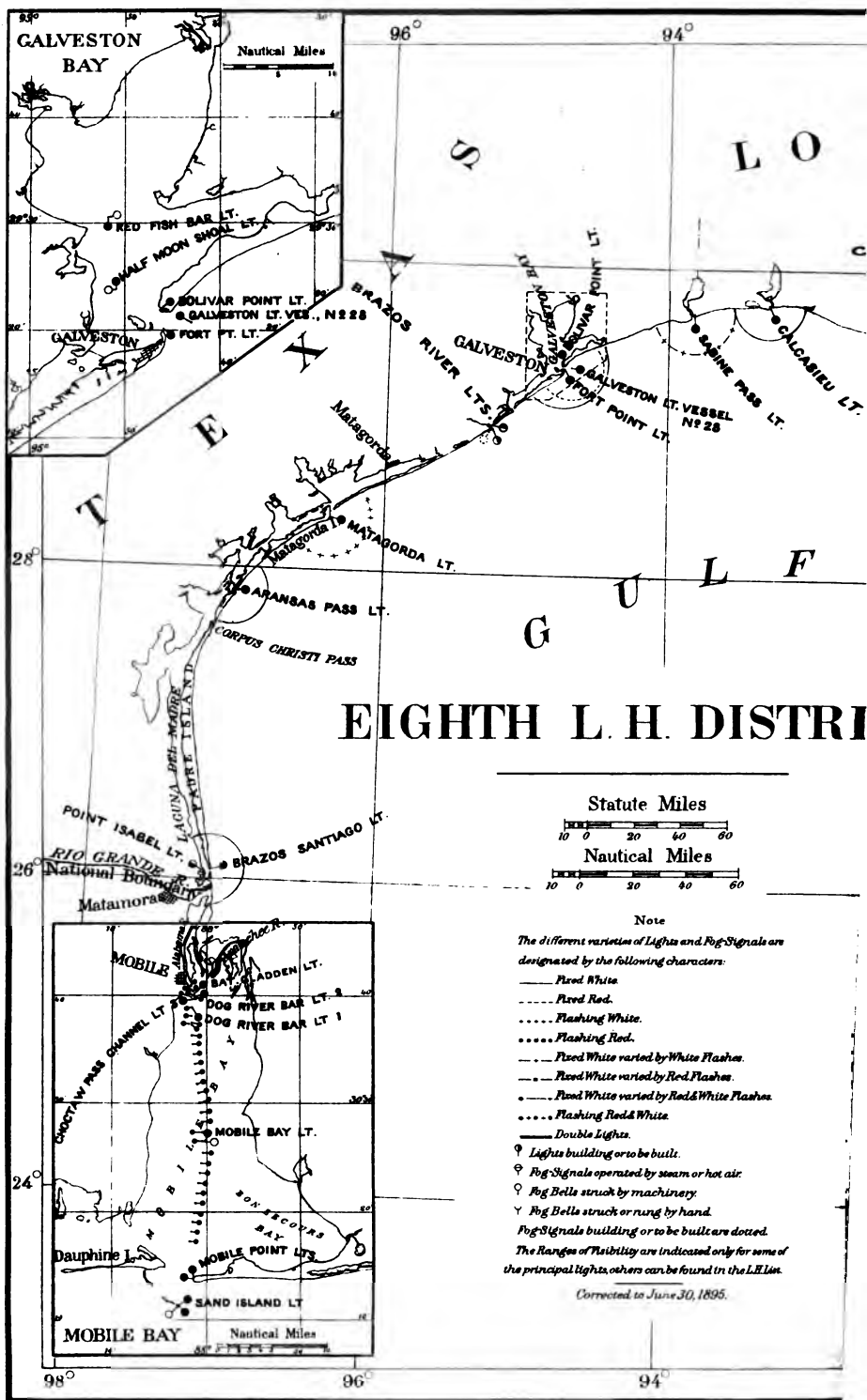
There is considerable lost motion in the rudder, and when the vessel is docked it will be unshipped and examined. The first whaleboat and dingey are in good condition. The second whaleboat, an old boat transferred from the tender *Putnam* before her sale, has been kept in service only by continued patching. She is beyond further repair and should be condemned and replaced by a new boat. The sails, awning, etc., are in good condition and will outlast the vessel. The engines are in fair condition, but need a thorough and general overhauling. The holding-down bolts are slack and can not be set up any farther without danger of their carrying away. A new tender with greater capacity for carrying buoys, with more deck room, and with more speed than the *Laurel* is urgently required to meet the increasing work of this district. The new lights that have been established during the past fiscal year will increase the mileage to be steamed per annum for inspections some 300 miles.

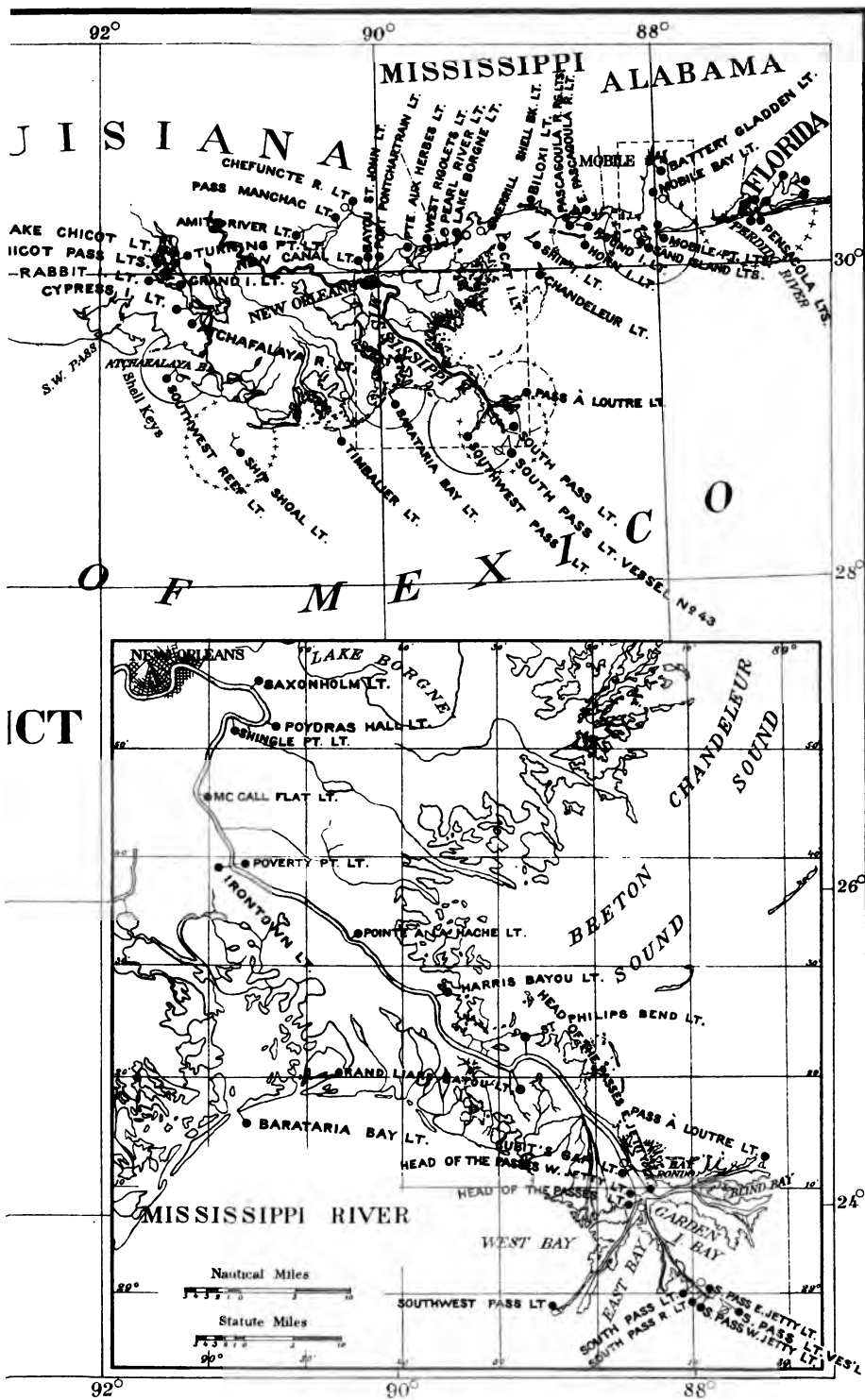
The following recommendation, which was made in effect in the Board's last annual report, is renewed:

*New tender.*—The *Laurel* is so old and so frail that it is quite evident that she has nearly survived her usefulness. If she can be kept in commission until a new tender is built and ready for service it will be as much as can reasonably be expected. It is estimated that a tender can be built specially fitted for service in the Gulf of Mexico and its tributaries for not exceeding \$75,000, and it is recommended that an appropriation of this amount be made therefor.











## EIGHTH DISTRICT.

This district extends from (but does not include) Perdido Entrance, Florida, to the southern boundary of Texas. It embraces all aids to navigation on the Gulf coast of the United States and tidal waters tributary to the Gulf between the limits named, together with those on the Mississippi River below New Orleans, and on Grand Lake and Lake Chicot.

*Inspector*.—Commander Joseph B. Coghlan, United States Navy.

*Engineer*.—Maj. James B. Quinn, Corps of Engineers, United States Army.

In this district there are—

Light-houses and beacon lights (including 18 post lights on the Mississippi River, Grand Lake, and Lake Chicot).....	99
Light-ships in position.....	2
Day or unlighted beacons.....	13
Fog signal operated by steam.....	1
Fog signals operated by clockwork.....	11
Lighted buoys in position (gas).....	2
Whistling buoys in position.....	4
Bell buoys in position.....	2
Other buoys in position.....	101
Steamer <i>Pansy</i> , buoy tender, and for supply and inspection.....	1
Steamer <i>Arbutus</i> , for construction and repair in the Seventh and Eighth districts.....	1

## LIGHT-STATIONS.

807. *Sand Island, off Mobile Point, Gulf of Mexico, Alabama*.—About February 1, 1895, a fixed white reflector light was established on the roof of the keeper's dwelling, 780 feet in the rear of the light tower. Various repairs were made. Several inspections of this site were made during the year. The island is gradually receding and it is probable that in a very short time the light will be in advance of the shore line. It is estimated that the site can be made secure for not exceeding \$12,000, and it is recommended that an appropriation of this amount be made therefor.

812. *Dog River Bar, beacon No. 1, Mobile Bay, Alabama*.—Two new Funck lamps were supplied for the use of this beacon.

813, 814. *Dog River Bar and Choctaw Pass Channel ranges, beacon No. 2, and Choctaw Pass Channel, beacon No. 3, Mobile Bay, Alabama*.—Three new Funck lanterns were supplied for the use of these beacons.

815. *Battery Gladden, below the mouth of Mobile River, Alabama*.—A new iron floor was put in the lantern. Various repairs were made.



## SEVENTH DISTRICT.

This district extends from a point just south of Jupiter Inlet light-station to and including Perdido Entrance, Florida. It embraces all aids to navigation on the sea and Gulf coasts of Florida, and on other tidal waters tributary to the sea and Gulf between the limits named.

*Inspector.*—Commander William B. Newman, United States Navy.

*Engineer.*—Maj. James B. Quinn, Corps of Engineers, United States Army.

There are in this district—

Light-houses and lighted beacons .....	44
Day or unlighted beacons .....	36
Whistling buoys in position .....	3
Bell buoys in position .....	5
Other buoys in position .....	256
Steamer <i>Laurel</i> , buoy tender and for supply and inspection .....	1
Steamer <i>Arbutus</i> , for construction and repair in the Seventh and Eighth districts. ....	1

## LIGHT-HOUSES.

— *Hillsboro Inlet, off Hillsboro Point, between Jupiter Inlet and Fowey Rocks lights, Atlantic coast of Florida.*—The following recommendation was made in the last ten annual reports of the Board:

The establishment of a light at or near Hillsboro Point, Florida, would be of great assistance to all vessels navigating these waters. Steamers bound southward, after making Jupiter Inlet light, hug the reef very closely to avoid the current. The dangerous reef making out from Hillsboro Inlet compels them to give it a wide berth and to go out into the Gulf Stream. Vessels coming across from the Bahama Banks would be able to verify their position if a light were placed here—a difficult matter in case they fail to make Jupiter Inlet. The establishment of this light would complete the system of lights on the Florida reefs.

The Board therefore renews the recommendation that \$90,000 be appropriated for this purpose.

771. *Key West, Key West Island, Gulf of Mexico, Florida.*—Some 550 feet of fence were put up. The work of increasing the height of the tower 20 feet was completed February 8, 1895, under contract, and the regular light was reestablished on February 5, 1895. During the progress of the work a temporary light was shown from a pole.

775. *Tortugas Harbor, on a bastion of Fort Jefferson, Garden Key, one of Tortugas group, Florida.*—Some 390 feet of iron fence were built. Extensive repairs were made.

776. *Sanibel Island, entrance to San Carlos Harbor and port of Punta Rassa, Florida.*—A second-order oil house was completed at this station under contract. Extensive repairs were made.

## Eighth District.

*estimated, and a sum of \$25,000. Recommendation is made that an appropriation of this amount be made for carrying out the effect.*

*874. Red Fish Bar light-station, Texas.*—This light is almost useless as an aid to navigation in its present location. A light upon the edge of the channel which has been cut through Red Fish Bar would be of much service. The buildings of the station have decayed to such an extent that it is impracticable to remove them and place them elsewhere. It is estimated that to reestablish this light on the edge of the channel, where it would be of great use to vessels going through the cut, would cost, say, \$5,000, and it is recommended that an appropriation of this amount be made therefor.

*875. Brazos River, Gulf of Mexico, Texas.*—The site for this station was acquired by condemnation. Plans were prepared, and proposals for furnishing the metal work and for erection were opened May 1, 1895, and contract for the erection was awarded. The price asked for furnishing the metal work was not considered advantageous, so the bids were rejected and the work was readvertised. The new bids were opened on June 12, 1895, and the lowest was accepted. The contract will be made at an early date, and the work will be begun and probably finished before the close of the next fiscal year.

*876. Matagorda, Gulf of Mexico, Texas.*—A third-order oil house was built by contract. Minor repairs were made.

*877. Aransas Pass, Gulf of Mexico, Texas.*—A second-order oil house was built by contract.

*878. Brazos Santiago, south end of Padre Island, Gulf of Mexico, Texas.*—Extensive repairs were made. Two new cisterns were put up.

*879. Point Isabel, Gulf of Mexico, Texas.*—The title to this reservation was obtained and the deed was recorded. The work of putting the station in thorough repair for the reestablishment of the light was completed in May, 1895, and notice was issued that the light would be exhibited on or about July 15, 1895.

— *Reimbursement of light-keepers for losses sustained during the hurricane of October 1, 1893.*—The following recommendation, which was made in the Board's last annual report, is renewed:

Statement of these losses, to the amount of \$2,603.62, approved and recommended by the Inspector of the Eighth light-house district, were sent by the Secretary of the Treasury to the Speaker of the House of Representatives in his letters of March 7 and April 3, 1894, with recommendation that reimbursement be made. The Board recommends that an appropriation of this amount be made therefor.



**Eighth District.****REPAIRS.**

At each of the following-named stations repairs more or less extensive were made during the year:

810. Mobile Point, Ala.	828. Port Pontchartrain, La.
811. Mobile Bay, Ala.	831. Chefuncte River, La.
817. Round Island, Miss.	832. Pass Manchac, La.
818. Pascagoula River range, front, Miss.	835. Pass a Loutre, La.
819. Pascagoula River range, rear, Miss.	842. Head of the Passes, La.
823. Cat Island, Miss.	871. Bolivar Point, Tex.
824. Merrill Shell Bank, Miss.	872. Fort Point, Tex.
825. Lake Borgne, Miss.	873. Halfmoon Shoal, Tex.

**LIGHT-VESSELS.**

836. *South Pass light-vessel, No. 43, moored in 82 feet of water, off the South Pass entrance to the Mississippi River, Louisiana.*—She was moored on November 5, 1894, off the South Pass, in accordance with authority given in the act approved August 18, 1894. During the summer of 1894 this vessel was towed to New Orleans from Trinity Shoal, Louisiana, and her hull and boilers were repaired, but it was found that a pressure of only 30 pounds of steam could be carried. On November 17, 1894, while carrying but 25 pounds of steam, a hole was blown in the back leg of the boiler and 9 tubes leaked badly. The ship's force put a soft patch on the leg of the boiler and expanded 14 tubes in the back end. During the foggy season the whistle was used, but owing to the dangerous condition of the boilers enough steam could not be carried to give a loud blast. Various repairs were made to the hull of the vessel. A light roof was built over the quarter-deck 24 feet long and 15 feet wide to catch water and for shelter. A new lantern mast was supplied. The main rigging was stripped and renewed by the crew of the vessel while in New Orleans.

870. *Galveston light-vessel, No. 28, inside of Galveston Bar, Gulf of Mexico, Texas.*—This vessel is in fair condition. A new square stern sail boat, 22 feet long and 5 feet 9 inches beam, was supplied. The copper on the ship's bottom is in only fair condition.

**DAY OR UNLIGHTED BEACONS.**

The black beacon on the east side of the channel from Quarantine to the city of Galveston was run into by the steamer *Charles Fowler* on April 1, 1895, and was totally destroyed. The other beacons in the district are in fair condition.

*Horn Island Pass and Northwest Spit of Round Island, Mississippi.*—The establishment of day beacons at these points would be of great benefit to the many vessels using the contiguous waters. It is estimated that the beacons could be constructed for not exceeding \$1,300, and it is recommended that an appropriation of this amount be made therefor.

**Eighth District.****FOG SIGNAL OPERATED BY STEAM OR HOT-AIR ENGINES.**

836. *South Pass light-vessel, No. 43, Louisiana.*—The 12-inch steam whistle was in operation some 148 hours and consumed about 9 tons of coal.

**BUOYAGE.**

The buoyage of this district was kept in good order by the tender *Pansy*. During the year the following-named changes were made: A bell buoy was placed on Trinity Shoal, Louisiana. A first-class nun buoy was placed in Galveston Entrance. The turn buoy in Galveston Entrance was changed from a second to a first class can buoy. The whistling buoy off South Pass was discontinued. A third-class can buoy was placed in the channel off Round Island North Spit. A second-class nun buoy was placed in Cat Island Channel. Three second-class nun buoys were placed in Breton Island Sound. A second-class and three third-class nun buoys were placed in the Southwest Pass of the Mississippi River. The second-class can buoy at Merrill Coquille was moved about  $1\frac{1}{4}$  miles from its former position. A second-class can buoy was placed at the entrance to Mobile Bay as a watch buoy in the position of the whistling buoy taken up for the summer. A whistling buoy was substituted for the first-class nun buoy on Horn Island Bar. The second-class can buoy which marked the wreck of the *Rosalie Smith* in the channel into Ship Island anchorage was discontinued. The third-class can buoy in Atchafalaya Bay was discontinued. Two second-class can buoys in the new dredged channel from Bolivar Point to Red Fish Bar were discontinued. One second-class nun buoy in the new dredged channel from Bolivar Point to Red Fish Bar was discontinued. A third-class can buoy was placed in Galveston Entrance in the position of the black beacon recently destroyed. Two gas buoys were placed on the eastern side of the prolongation of the dredged channel in Mobile Bay. Two gas buoys, 6 pieces (15 fathoms each)  $1\frac{1}{4}$ -inch and 5 pieces (15 fathoms each)  $1\frac{1}{4}$ -inch chain, were received. Some 50 buoys were repaired by putting in new eyes and patches where necessary. Some 172 shackles were repaired, receiving new keys and rings.

**DEPOT.**

*Port Eads, Louisiana.*—This depot has recently received some slight repairs. Ten fender piles and three mooring piles were placed above the wharf for the accommodation of the South Pass light-ship while off her station during the summer months. Pipes leading to the cistern were replaced. The depot is badly crowded and a great number of buoys, sinkers, etc., remain in the open air exposed to the rain and intense sun, as there is no shelter for them.

**Eighth District.****TENDERS.**

*The Arbutus*.—This twin-screw steamer was actively employed during the year in making repairs to stations in the Seventh and Eighth districts. She was docked and repaired. During the year the *Arbutus* ran 13,646 miles and consumed 806½ tons of coal.

*The Pansy*.—This twin-screw steamer was engaged in caring for buoys, delivering fuel, provisions, and supplies to the light-houses and light-ships, and in conveying the inspector on his regular visits of inspection. During the summer of 1894, repairs were made to the hull, boiler, and machinery. The tender was used 17 days in cleaning and overhauling buoys and their appendages and also in improving the general condition of the depot grounds. During the year she placed 16, replaced 5, recovered 2, changed 82, and cleaned and painted 152 buoys. She also erected 3 new post lights, moved 3, and cut 10 acres of willows. She steamed some 8,390 miles and consumed about 476 tons of coal.

*Hired vessels*.—During the year the schooner *Camille* was employed under contract in making repairs to stations in the Eighth district, from September 25, 1894, to June 30, 1895.

## NINTH DISTRICT.

This district includes all aids to navigation on Lake Michigan, Green Bay, and tributary waters lying west of a line drawn across the Straits of Mackinac just east of Old Mackinac Point light-station, Michigan.

*Inspector.*—Commander James H. Dayton, United States Navy.

*Engineer.*—Maj. Milton B. Adams, Corps of Engineers, United States Army.

There are in this district—

Light-houses and beacon lights.....	96
Light-ships in position.....	4
Fog signals operated by steam.....	23
Fog signals operated by clockwork.....	7
Buoys in position.....	93
Steamer <i>Dahlia</i> , buoy tender, and for supply and inspection.....	1
Steamer <i>Amaranth</i> , engineer's tender, for repairs and construction.....	1
Steamer <i>Warrington</i> , engineer's tender, for repairs and construction.....	1
Steam launch <i>Lotus</i> , for construction and repair.....	1

## LIGHT-STATIONS.

1356. *Old Mackinac Point, Straits of Mackinac, Michigan.*—The rebuilding of the landing crib, which was carried away by ice, was completed in the early part of July. Extensive repairs were made.

1358. *St. Helena, Lake Michigan, Michigan.*—A new landing crib and boatways 140 feet long, provided with new boat rollers, were constructed. About 200 running feet of sidewalk were placed. Materials for the construction of an oil house were delivered. Various repairs were made.

1362. *Waugoshance, Lake Michigan, Michigan.*—Plans were made, with estimate of cost, for building a concrete protection to the pier. Contracts were entered into with the lowest bidders.

1364. *Beaver Island Harbor, Lake Michigan, Michigan.*—The cellar of the dwelling, which had been filled with gravel, was reexcavated, and a concrete floor 5 inches thick was laid. A 12-inch brick pier was built in the cellar. Various repairs were made.

1368. *South Fox Island, Lake Michigan, Michigan.*—An appropriation of \$5,500 was made by the act approved March 2, 1895, for establishing a steam fog signal at this station. Plans and a detailed estimate of cost were made. Material for the construction of an oil house was delivered.

1369. *Grand Traverse (Cat Head), Lake Michigan, Michigan.*—An addition was built to the barn. Material for the construction of an oil



# NINTH L.H. DISTRICT.

Corrected to June 30, 1895.

STATUTE MILES.

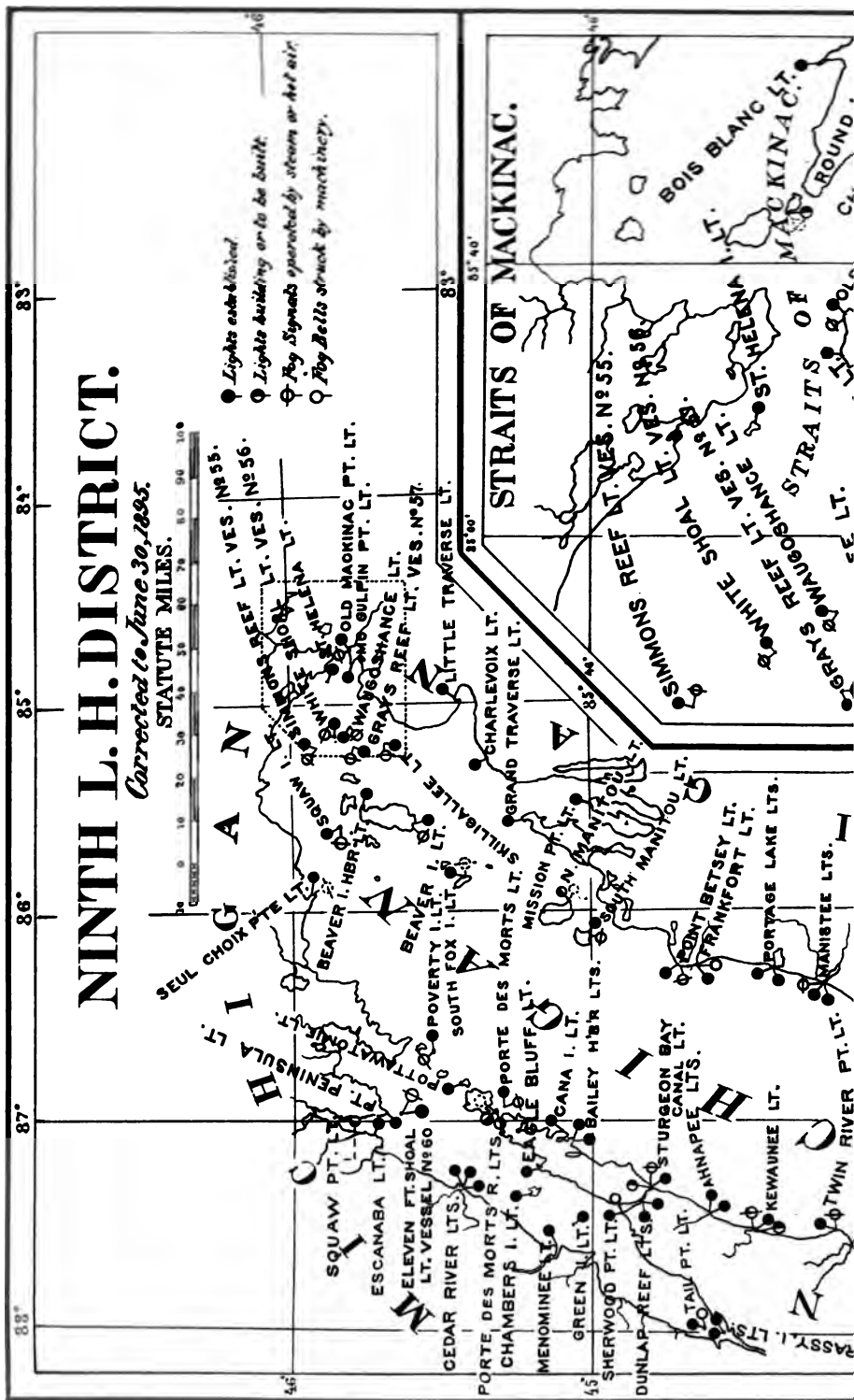


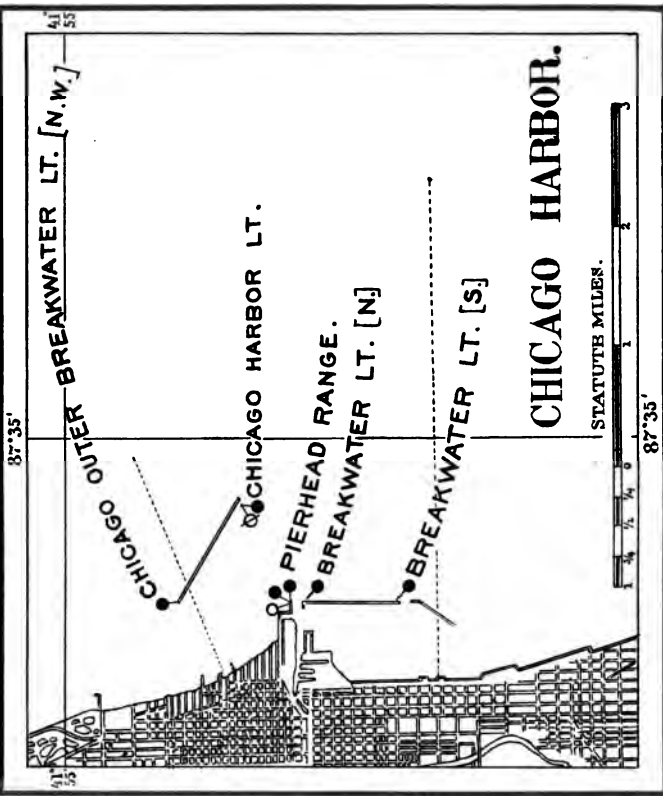
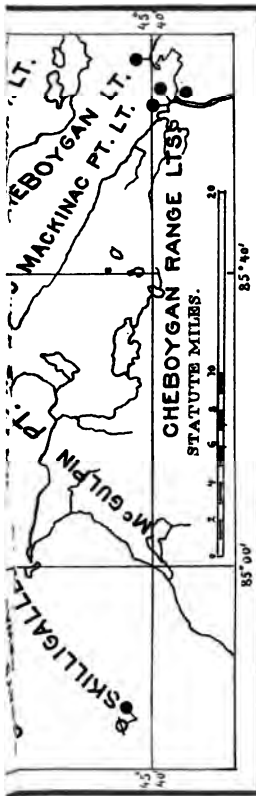
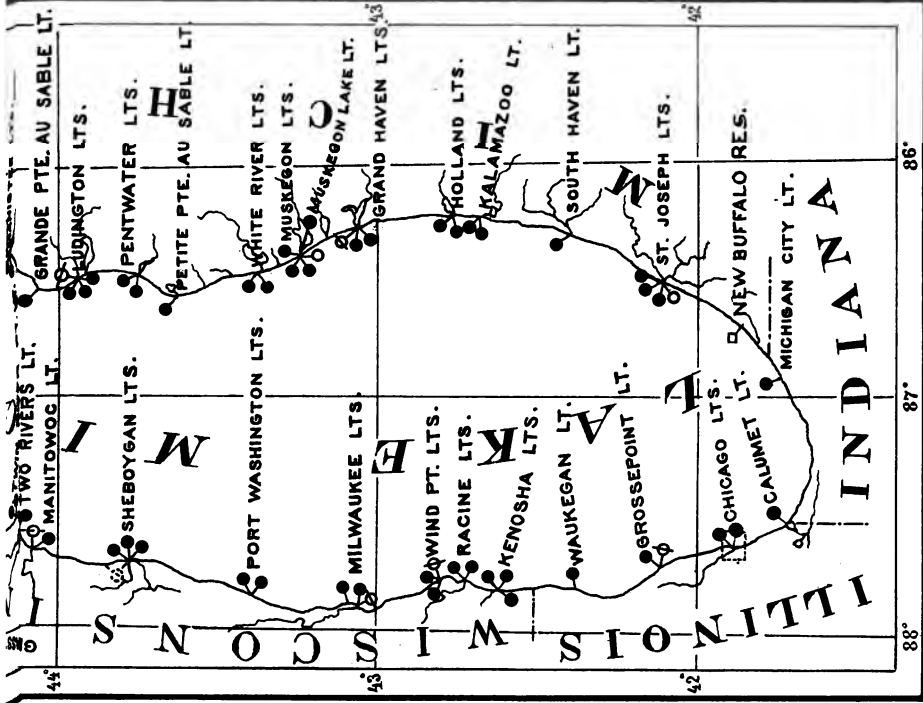
● Lights extinguished.

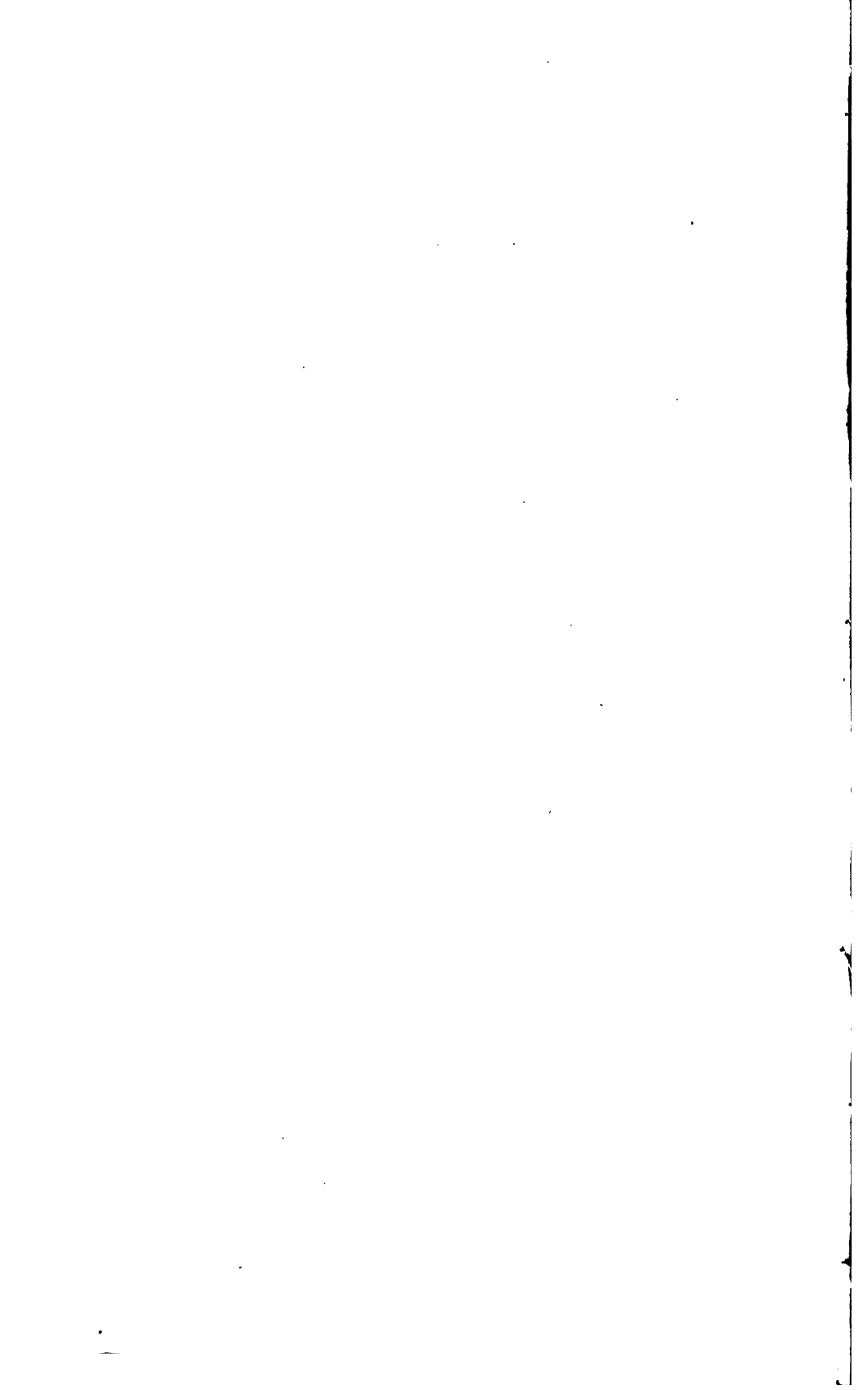
○ Lights building or to be built.

⊕ Fog Signals operated by steam or hot air.

⊙ Fog Bells struck by machinery.









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house was delivered. The establishment of a fog signal here is deemed necessary to navigation. It is estimated that it will cost not exceeding \$5,500, and it is recommended that an appropriation of this amount be made therefor.

1371. *North Manitou, Lake Michigan, Michigan.*—An appropriation of \$20,000 was made by the act approved March 2, 1895, for establishing a light and fog-signal station on this island. Negotiations for the purchase of a site are now in progress.

1372. *South Manitou, Lake Michigan, Michigan.*—Bids were opened March 2, 1895, for furnishing a fog-signal boiler, and contract was made therefor.

1373. *Point Betsey, Lake Michigan, Michigan.*—The dwelling was thoroughly renovated. An addition containing six rooms, with back building, was built onto the old dwelling which was converted into two separate houses under one roof. A sewer was laid, also a 3-foot walk around the station; sidewalks were laid. An old structure used as a barn was entirely reconstructed. The fog-signal machinery was overhauled. The apparatus was then tested under steam pressure and found to work well. Various repairs were made.

1378. *Manistee, Lake Michigan, Michigan.*—About 100 cubic yards of clay and muck were delivered for top-dressing the grounds around the keeper's dwelling, and the grounds were seeded. The fence surrounding the keeper's dwelling was extended so as to inclose all of the light-house grounds.

1382. *Ludington Pierhead, Lake Michigan, Michigan.*—The light tower was repaired. Some 100 running feet of elevated walk were rebuilt. An appropriation of \$5,500 was made in the act approved August 18, 1894, for the establishment of a fog signal here. A suitable building was erected, with the necessary apparatus. It consists of a substantial frame building, iron sheathed, placed upon a timber substructure. A breakwater, 48 feet long, was constructed to protect the building from the force of the sea on the south side. The machinery is in duplicate, consisting of one Kingsford compact boiler and one Fitzgibbons boiler, with steam pump and injector, and two 10-inch steam whistles operated by a duplicate Crosby automatic signal. The signal was put into operation January 31, 1895. During the construction of the work the structure and breakwater were damaged by the schooner *Austin*, while trying to make the harbor during a storm on November 15, 1894. An immense sea was running at the time, and the schooner was driven on the south side of the pier, striking the signal house about midway, and staving in about 20 feet. The damage was repaired at the close of that month.

1388. *Muskegon Pierhead (front), Lake Michigan, Michigan.*—A conduit 580 feet long, for running in and out the lantern exhibited at the outer end, was built and the light was exhibited at the outer end on July 25, 1894, for the first time.

**Ninth District.**

1389. *Muskegon Pierhead, Lake Michigan, Michigan.*—On September 11, 1894, a sixth-order lens, illuminating the entire horizon, was substituted for the one of 180 degrees formerly in use in the pierhead light tower. The bell tower and the elevated walk were repaired.

1390. *Muskegon, Lake Michigan, Michigan.*—A brick oil house was built. Various repairs were made.

1391. *Muskegon Lake beacon, Lake Michigan, Michigan.*—A post with platform was erected at the inner end of the entrance to Muskegon Lake, at the extremity of the boom piling. The light was exhibited for the first time May 10, 1895.

— *Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—This light was discontinued May 4, 1895, on account of the removal of the pierhead light to the outer end of the pier. The conduit was taken down and stored for future use.

1392. *Grand Haven Pierhead, Lake Michigan, Michigan.*—This light was moved some 500 feet, to the outer end of the south pier, and reestablished on May 4, 1895, without change of characteristic. One of the fog-signal houses was removed and rebuilt with enlarged capacity, located in the rear of the beacon at the outer end of the pier, and both signals were reestablished June 22, 1895, in one building, without change of characteristic. On April 4, 1895, contract was made for furnishing framing lumber. In April all other materials were ordered for the work of moving the beacon and building an elevated walk, and a working party was sent to the station. A temporary post light was erected at the outer end of the pier. A substructure was built for the fog-signal building. Boiler No. 1 was moved and set up on a brick foundation, the fog-signal apparatus was properly placed, attachments were made to the boilers, and steam was raised on June 22, 1895, when the signal was tested and found to work satisfactorily. A brick foundation was constructed for boiler No. 2, and the boiler was moved into the building. Some 486 running feet of elevated walk were built.

1399. *St. Joseph Pierhead range (front), Lake Michigan, Michigan.*—The elevated conduit from which this light is shown was damaged during a storm on November 13, 1894. A post was temporarily erected at the outer end of the conduit on November 14, and the light was exhibited therefrom. Various repairs were made.

1400. *St. Joseph Pierhead, Lake Michigan, Michigan.*—About 100 running feet of low elevated walk were built. Various repairs were made.

The following statement, made in the Board's last two annual reports, is repeated:

The establishment of a fog signal here, at a cost not to exceed \$5,000, was authorized by the act of February 15, 1893, but no appropriation has yet been made. The Board recommends that the amount named be appropriated.

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**1402. Michigan City, Lake Michigan, Indiana.**—The following recommendation, made in the Board's last annual report, is renewed:

The Board is of opinion that a fog signal, operated by steam or hot air, at this station would be a valuable aid to navigation. It is estimated that it could be established for a sum not to exceed \$5,500, and it is recommended that an appropriation of that amount be made therefor.

**1403. Calumet Pierhead, Lake Michigan, Illinois.**—Plans, specifications, and estimate of cost were made for rebuilding the elevated walk, 1,330 feet long, and the construction of a metal tower was contracted for in June, 1895. Bids were opened on May 25, 1895, for furnishing the material required for renewing the elevated walk. Contracts were entered into for furnishing the lumber. Various repairs were made.

**1407. Chicago Pierhead, Lake Michigan, Illinois.**—The old gasoline apparatus in use was replaced with a new plant.

— **South Milwaukee, Lake Michigan, Wisconsin.**—The following statement, made in the Board's last two annual reports, is repeated:

Recommendation was made through the proper channel to Congress in February, 1893, for the establishment of a light at this place. South Milwaukee is a village about 10 miles south of the city of Milwaukee. It is a thriving manufacturing place of some 1,200 inhabitants. There is a large business done here in building materials. It is claimed that it will double its population within a year. The Board is of the opinion that a light should be established on the north pier at the harbor. It is estimated that it will cost, say, \$7,500, and it is recommended that an appropriation of this amount be made therefor.

**1422. Sheboygan Pierhead range (front), Lake Michigan, Wisconsin.**—The elevated conduit for the front range light was damaged by a schooner during a storm, but was rebuilt at once.

**1423. Sheboygan Pierhead, Lake Michigan, Wisconsin.**—An appropriation of \$5,500 was made in the act approved March 2, 1895, for establishing a steam fog signal at this station. Plans and detailed estimate of cost therefor were prepared.

**1425. Manitowoc Pierhead, Lake Michigan, Wisconsin.**—An appropriation of \$5,500 was made by the act approved March 2, 1895, for the establishment of a steam fog signal here. Plans and detailed estimate of cost were made of a fog signal on the pier. Plans and estimate of cost were made for removing the old light-station building, regrading the grounds, and rebuilding the dwelling for the accommodation of two keepers. Contracts were made for furnishing the material for rebuilding the keeper's dwelling, and for furnishing the material for building the fog-signal house.

**1427. Twin River Point, Lake Michigan, Wisconsin.**—The construction of the metal work required to modify the old Chicago River light tower for erection here was completed. All the lumber, tools, and appliances, rubble and crushed stone, cement, and all the old parts of the tower which had been stored at the Chicago River light-station

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were brought here by the tender *Amaranth*. The concrete foundation for the structure was completed, and the erection of the metal work was begun. In September the excavations for the foundations for the eight columns were completed, the concrete piers were constructed, the foundation disks and cylinder bases were set, bedded, and grouted, and portions of the metal work of the first series were erected. The site of the new location was raised about 2½ feet and graded.

In October fully 166,000 pounds of metal work had been erected to the upper part of the fourth story, bringing the structure to the main gallery deck. In November the main deck, service room, and watch room and decks, lantern parapet railing, and the lantern were erected, and the illuminating apparatus transferred from the old structure and erected in the new one. The erection of the new skeleton iron tower at this station was completed on December 1, 1894. Plans, specifications, and estimate of cost for making alterations and additions to the keeper's dwelling and the removal of the old brick tower were made in January, 1895. The material for doing this work was purchased and delivered by the tender *Amaranth*, and a working party was sent to the station April 10, 1895, when operations were begun. The boat landing was extended 84 feet. When the work of renovation is completed this station will be in first-class order.

— *Kewaunee Pierhead range (front), Lake Michigan, Wisconsin.*—The elevated conduit, from which the front pierhead range light was shown, was taken down, and on November 7, 1894, the light was discontinued.

1428. *Kewaunee Pierhead, Lake Michigan, Wisconsin.*—The work of rebuilding the oil house was finished on July 3, 1894. The pierhead beacon tower was moved 300 feet nearer the outer end of the pier. Some 275 feet of elevated walk were erected. Pursuant to the appropriation of \$5,500 made by special act approved August 4, 1894, for the establishment of a fog-signal station, the material required for its construction and the fog-signal boilers and machinery were ordered. A substructure for the building was erected and securely bolted to six of the cross-ties of the pier. The fog-signal building was completed, and the fog-signal boilers were finished, inspected, tested, and delivered in December, 1894, in the latter part of the month. The boilers and machinery were set up and completed, and the signals were tested soon after. The Crosby automatic signals were placed, and on January 31, 1895, the signals were put in operation.

1430. *Ahnapee Pierhead (rear), Lake Michigan, Wisconsin.*—A fifth-order lens was substituted for the lens lantern on June 5, 1895.

1431. *Sturgeon Bay Canal, Lake Michigan, Wisconsin.*—An appropriation of \$20,000 was made by the act approved March 2, 1895, for establishing a light-station at or near the entrance to Sturgeon Bay Canal. Steps are being taken for doing this as soon as practicable.

1437–1438. *Porte des Morts range, Lake Michigan, Wisconsin.*—The act approved March 2, 1895, provided \$21,000 for the establishment of

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range lights and a steam fog signal on or near Plum Island in the *Porte des Morts* (Death's Door) passage, entrance to Green Bay. Proper measures are being taken to do this as soon as practicable.

1440. *Poverty Island, Lake Michigan, Michigan.*—A circular iron oil house was erected in September, 1894. A boat landing was built in the shape of an L, so as to form a harbor for the keeper's boat. An additional crib was built to form a breakwater to the new landing. Various repairs were made.

— *Manistique, Lake Michigan, Michigan.*—The following statement, made in the Board's last annual report, is repeated:

The establishment of a coast light and fog signal here, at a cost not to exceed \$32,000, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that the amount named be appropriated.

1441. *Scul Choix Pointe, Lake Michigan, Michigan.*—Provision was made for completing this station by the act approved August 18, 1894, making the \$5,000 appropriated August 5, 1892, for moving St. Marys River upper range lights available therefor. An estimate of cost for completing the tower and dwelling was made, and bids were invited and opened on March 9, 1895, for the materials, which were purchased, with supplies for the working party, and loaded on the tender *Amaranth*, and the working party was organized and transported to the light-house site, and operations were begun. The interior of the dwelling was largely replastered; the elevator and hoisting engine for handling material for the tower were placed; the boathouse was nearly finished; the oil house was completed; the tower was built up from 20 feet 8 inches above grade to 56 feet 4 inches; stone for the circular windows was cut and set in place, and the circular stairs and landings to the third platform were completed. By the act approved March 3, 1893, an appropriation of \$3,300 was made for completing the fog signal, but no money had been previously appropriated. The act approved August 18, 1894, appropriated \$2,200 for beginning the fog signal. Plans, specifications, and estimate of cost of establishing the fog signal were made. The material required for this work was ordered and delivered by the *Amaranth*. Contracts were made for furnishing two fog-signal boilers. Excavations for the fog-signal house were made, concrete footings were put in, walls were built up to the roof plates, and the exterior of the foundation walls was plastered to grade with cement mortar. The roof and cornices were completed, ironed, and painted, the floor was filled in, the site was graded, and a brick foundation was prepared for the boilers.

1445. *Escanaba, Green Bay, Michigan.*—Various repairs were made. The following recommendation was made in the Board's last five annual reports:

A steam signal here is not essential, as the navigation of Little Bay de Noquette is quite unobstructed, and with a steam whistle on Eleven-Foot Shoal a vessel should

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be able to reach the point with reasonable safety. A fog bell struck by machinery in the light-station at Escanaba, on Sand Point, would be a valuable addition to the service of this station. It can be set up for about \$1,100. It is recommended that an appropriation of this amount be made therefor.

The Board is now of opinion that a steam or other powerful signal is needed here. It is estimated that it can be established for not exceeding \$5,000, and it is recommended that an appropriation of this amount be made therefor.

1446. *Squaw Point (Gladstone), Little Bay de Noquette, an extension of Green Bay, Michigan.*—By the act approved March 2, 1895, the sum of \$5,000 was appropriated to establish a light at or near Squaw Point, Little Bay de Noquette. The proper measures are being taken to carry this appropriation into effect.

1447. *Cedar River, Green Bay, Michigan.*—A well was drilled to a depth of 120 feet, and a plentiful supply of water was obtained and necessary connections to the pump were made.

1450. *Eagle Bluff, Green Bay, Wisconsin.*—A well was drilled on the light-house site for providing water for domestic purposes.

1452. *Menominee Pierhead, Green Bay, Lake Michigan, Michigan.*—A fog signal is needed here. The latest available statistics for the year ending December 31, 1893, give the number of arrivals and departures of vessels at 2,040, having a total of 504,819 tons. It is estimated that a proper fog signal could be established here for, say, \$5,000, and it is recommended that an appropriation of this amount be made therefor.

— *Menasha, Green Bay, Wisconsin.*—The following recommendation, which was made in the Board's last five annual reports, is renewed:

It is now difficult to make the Menasha River at night on account of the cut through the rock and the earth cut, which is found to be quite intricate. To meet this difficulty it is proposed to establish here two range lights, one to be placed on the site of the old Menasha light, which was discontinued under the operations of the act of March 3, 1859, which site is still Government property; the other to be placed on the northeast end of Doty Island, adjacent to the channel, which was dredged out in 1887.

It is estimated that these range lights can be established for a sum not to exceed \$500, and it is recommended that an appropriation of this amount be made therefor.

### REPAIRS.

During the fiscal year repairs more or less extensive were made at each of the following-named stations:

1363. Skilligalee, Mich.

1365. Beaver Island, Mich.

1366. Little Traverse, Mich.

1367. Charlevoix Pierhead, Mich.

1370. Mission Point, Mich.

1374. Frankfort Pierhead, Mich.

1375, 1376. Portage Lake Pierhead range,  
Mich.

1377. Manistee Pierhead, Mich.

1379. Grande Pointe au Sable, Mich.

1385. Petite Point au Sable, Mich.

1387. White River, Mich.

1395. Holland Pierhead, Mich.

1398. South Haven Pierhead, Mich.

1401. St. Joseph, Mich.

1402. Michigan City, Ind.

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1404. Chicago Breakwater, south, Ill.	1432. Sturgeon Bay Canal Pierhead, Wis.
1408. Chicago Harbor, Ill.	1434. Bailey Harbor range (rear), Wis.
1410. Grossepoint, Ill.	1435. Cana Island, Wis.
1412. Kenosha, Wis.	1436. Porte des Morts, Wis.
1413. Kenosha Pierhead range (front), Wis.	1439. Pottawatomie, Wis.
1415. Racine Pierhead, Wis.	1442. Squaw Island, Mich.
1416. Racine, Wis.	1453. Green Island, Wis.
1417. Wind Point, Wis.	1454. Sherwood Point, Wis.
1418. Milwaukee Pierhead, Wis.	1455. Dunlap Reef range (front), Wis.
1420. Port Washington Pierhead, Wis.	1456. Dunlap Reef range (rear), Wis.
1421. Port Washington, Wis.	1457. Tail Point, Wis.
1424. Sheboygan, Wis.	1458. 1459. Grassy Island (upper and lower), Wis.
1426. Two Rivers Pierhead, Wis.	

**LIGHT-VESSELS.**

1359. *Simmons Reef light-vessel, No. 55, Straits of Mackinac, Lake Michigan, Michigan.*—This vessel left her station on December 10, 1894, and went into winter quarters at Cheboygan, Mich. On April 24, 1895, she returned to her station. This vessel is in good condition.

1360. *White Shoal light-vessel, No. 56, Straits of Mackinac, Lake Michigan, Michigan.*—This vessel left her station on December 12, 1894, and went into winter quarters at Cheboygan, Mich. On April 20, 1895, she returned to her station. This vessel is in good condition.

1361. *Grays Reef light-vessel, No. 57, Straits of Mackinac, Lake Michigan, Michigan.*—This vessel left her station on December 12, 1894, and went into winter quarters at Cheboygan, Mich. On April 20, 1895, she returned to her station. This vessel is in good condition.

1444. *Eleven-Foot Shoal light-vessel, No. 60, about midway between Eleven-Foot Shoal and Corona Shoal, Green Bay, Lake Michigan, Michigan.*—This vessel lost her moorings in the fall of 1894 by the slipping of a shackle-pin. She was towed into position and remoored a few days afterwards by the light-house tender *Dahlia*. She left her station on December 7, 1894, and went into winter quarters at Escanaba, Mich. On April 19, 1895, she returned to her station. This vessel is in good condition.

**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

1356. *Old Mackinac Point, Michigan.*—The 10-inch steam whistle, in duplicate, was in operation some 600 hours, and consumed about 4 tons of coal and 33 cords of wood.

1359. *Simmons Reef light-ship, No. 55, Michigan.*—This 6-inch steam whistle was in operation some 371 hours, and consumed about 22 tons of coal and 3 cords of wood.

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1360. *White Shoal light-ship, No. 56, Michigan.*—This 6-inch steam whistle was in operation some 459 hours, and consumed about 23 tons of coal and 3 cords of wood.

1361. *Grays Reef light-ship, No. 57, Michigan.*—This 6-inch steam whistle was in operation some 465 hours, and consumed about 21 tons of coal and 2 cords of wood.

1362. *Waugoshance, Michigan.*—The 10-inch steam whistle, in duplicate, was in operation some 391 hours, and consumed about 7 tons of coal and 25 cords of wood.

1363. *Skilligalee, Michigan.*—The 10-inch steam whistle, in duplicate, was in operation some 326 hours, and consumed about 8 tons of coal and 30 cords of wood.

1365. *Beaver Island, Michigan.*—The first-class steam sirens, in duplicate, were in operation some 348 hours, and consumed about 22 cords of wood.

1372. *South Manitou, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation some 928 hours, and consumed about 2 tons of coal and 73 cords of wood.

1373. *Point Betsey, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation some 1,312 hours, and consumed about 68 cords of wood.

1377. *Manistee Pierhead, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation some 657 hours, and consumed about 52 tons of coal and 3 cords of wood.

1382. *Ludington Pierhead, Ludington, Mich.*—This 10-inch steam whistle, established January 31, 1895, was in operation some 306 hours, and consumed about 24 tons of coal and 1 cord of wood.

1392. *Grand Haven Pierhead, Michigan.*—The first-class steam sirens, in duplicate, were moved to a point 95 feet from the end of the pier June 27, 1895. They were in operation some 363 hours, and consumed about 28 tons of coal and 1 cord of wood.

1408. *Chicago Harbor, Illinois.*—The 10-inch steam whistles, in duplicate, were in operation some 370 hours, and consumed about 42 tons of coal and 9 cords of wood.

1410. *Grossepoint, Illinois.*—The 10-inch steam whistles, in duplicate, were in operation some 302 hours, and consumed about 23 tons of coal and 2 cords of wood.

1417. *Wind Point, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation some 716 hours, and consumed about 44 tons of coal and 2 cords of wood.

1418. *Milwaukee Pierhead, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation some 758 hours, and consumed about 32 tons of coal and 9 cords of wood.

1427. *Twin River Point, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation some 636 hours, and consumed about 42 tons of coal and 11 cords of wood.



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1428. *Kewaunee Pierhead, Wisconsin.*—The 10-inch steam whistle established January 31, 1895, was in operation some 315 hours, and consumed about 27 tons of coal and 2 cords of wood.

1432. *Sturgeon Bay Canal Pierhead, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation some 667 hours, and consumed about 58 tons of coal and 4 cords of wood.

1436. *Porte des Morts, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation some 548 hours, and consumed about 27 tons of coal and 19 cords of wood.

1440. *Poverty Island, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation some 489 hours, and consumed about 6 tons of coal and 48 cords of wood.

1442. *Squaw Island, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation some 258 hours, and consumed about 10 tons of coal. No wood was used.

1444. *Eleven-Foot Shoal light-vessel, No. 60, Michigan.*—The 6-inch steam whistle was in operation some 585 hours, and consumed about 27 tons of coal and 4 cords of wood.

**BUOYAGE.**

The buoyage of the district is in good condition. With few exceptions it was attended to by the light-house tender *Dahlia*. A second-class black can buoy was established June 27, 1895, on the shoals off South Point, Milwaukee Bay, in 20 feet of water. The second-class red nun buoy was moved April 27, 1895, about 1,200 feet from its former position, and is now in 19½ feet of water. The red and black horizontal striped spar buoy was moved June 13, 1895, about 2,160 feet northeast from its former position, and is now in 18 feet of water. The red spar buoy marking the end of the shoal between Pensaukee and Oconto rivers was, on October 16, 1894, discontinued.

An additional red spar buoy was established between the fifth buoy, new cut, and the mouth of the Fox River, and named "Sixth buoy, new cut." The name of the former "Sixth buoy, new cut," was at the same time changed to "Seventh buoy, new cut."

The iron buoys were taken up in December, and spar buoys painted in the same manner were substituted for them for the winter. The iron buoys were replaced in April.

The iron buoys are now replaced in winter by full sized spar buoys, well anchored, instead of mere markers, as formerly.

**DEPOTS.**

*St. Joseph, Mich.*—Arrangements were made for the construction of a boathouse under the inner end of the wharf. Plans, specifications, and estimate of cost were made for the construction of a buoy shed and a 10-ton derrick for the extension of the tramway and for making other

### Ninth District.

minor improvements. The site was fertilized and seeded. Some 420 cubic yards of drift sand were removed from the depot grounds. Contract was made for a scow in which to transport freight across the river. Supplies and stores for the whole district were received here in bulk from the general light-house depot, and were distributed from here to the different light-houses of the district.

*Light-house depot for the Ninth and Eleventh light-house districts, at Scammons Harbor, northern part of Lake Huron, Michigan.*—The following recommendation, made in the Board's last three annual reports, is renewed:

There are now in service in the Ninth district 15 steam fog signals, and in the Eleventh district 20, a total of 35. Provision has been made by appropriation for the construction of several more in each district, the greater number of which will be erected during the coming year; and in addition there are recommendations, applications, and pending legislation for a number, say a dozen more, for the most of which it is probable appropriation will be made in the near future. Owing to the intricacies of navigation, the prevalence of fogs, and the somewhat frequent snow squalls and storms, not less than 24 or 25 of the steam signals to be operated will be concentrated about the northern portions of lakes Huron and Michigan, counting from Thunder Bay Island in Lake Huron, through the Straits of Mackinac, to Point Betsey in Lake Michigan, and including the stations guarding the entrances into Green Bay.

The work of supplying the existing stations with coal is already arduous, and tasks the time of the buoy tenders, which might be employed to much greater advantage in other work. With the rapid increase in the number of the signals, it seems desirable that some better provision be made for the delivery of the fuel than its transportation from Detroit and Chicago by the single tender employed in each district. The average consumption of coal at each fog-signal station is 18 tons, so that for the 35 indicated stations near the northern ends of the two lakes there will be needed some 630 tons per annum. If some 200 tons additional be allowed for the use of the two tenders in the same region, the total amount required will be, say, 830 tons.

The buoyage of the two districts is also steadily increasing with the greater number, draft, and tonnage of the lake shipping. Not only are there more buoys needed, but larger ones, as special difficulties are from time to time discovered and the need is discovered of greater visibility and better warning to vessels. It is quite evident, therefore, that the buoy tenders will be more taxed each year to give proper attention to the placing and relief of the buoys, many of which are now looked after by contractors in each district, to maintain the necessary frequency and thoroughness of inspections, and to keep the numerous light-stations supplied with their regular stores, all within the seven or eight months of navigation during which the work must be performed.

In the localities above indicated there are numerous points which, lying in or near the track of vessels, are dangerous to navigation by reason of not being sufficiently marked by buoys.

To provide for the convenient and economical coaling of the fog-signal stations in the two districts it will be advantageous to establish a depot at a suitable place in the vicinity of the Straits of Mackinac; and Scammons Harbor, now owned by the Light-House Establishment, suggests itself as a place in every way desirable for the purpose. The shelter is perfect, the access is easy, and the location is sufficiently central and of ample size. It will be necessary to construct a suitable wharf, coal

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shed, quarters for station-keeper, and other adjuncts for coaling service. In addition there should be two scows for the service of the depot, the employment of which would, in general, be as follows:

To coal the steam fog signals the scows would be loaded to a draft of, say, 3 feet and be towed from the depot to the stations. In ordinary cases the scow could go alongside and the coal be handled ashore directly and without loss of time, instead of being loaded, as now, into a boat from a light-house tender lying off a distance, from which several trips must be made with oars to complete the work.

A preliminary estimate of the cost of the plant recommended is as follows:

For the wharf and buoy shed .....	\$7, 500
For quarters, etc. ....	3, 000
For two scows.....	4, 000
Contingencies .....	500
Total.....	15, 000

With the multiplication of the aids to navigation in the vicinity of the Straits of Mackinac the economy of using in certain localities light-ships of moderate dimensions and small cost in lieu of permanent light-stations, it is evident that the construction of the coaling and buoy depot for the common use of both the Ninth and Eleventh districts will be of great value to the Light-House Service. It is estimated that this depot can be established for not exceeding \$15,000, and it is recommended that an appropriation of this amount be made therefor.

### TENDERS.

*The Dahlia*.—This iron screw steamer was sent to Detroit in July, 1894, to have her propeller shifted, two of the blades of the old one having been broken. She was employed during the summer and fall of 1894 in supplying fog signals and light-vessels with fuel, inspecting stations, and in attendance on the buoyage of the district. She returned to Chicago on December 12, 1894, after having taken up the iron buoys for the winter. Her crew was discharged at the end of the year. The officers were given leave of absence, and she was frozen out for two months for sanitary purposes. On the opening of navigation a crew was employed and the iron buoys were replaced. Since then she has been engaged in inspection and supply trips and attendance on buoyage. During the year she steamed 9,366 miles and consumed 512 gross tons of coal.

*The Amaranth*.—This steel, screw steamer was employed during July, August, and September, 1894, in delivering material for repairs at Waugoshance, Skilligallee, Beaver Island, South Manitou, Point Betsey, Portage Lake, and Squaw Island light-stations, Michigan, Grossepoint, Illinois, and Twin River Point light-station, Wisconsin, in transferring ironwork from Chicago to Twin River Point light-station, Wisconsin, in conveying material to Point Betsey and Green Island, and in bringing back the old illuminating apparatus from Porte des Morts light-station. She was employed during May in transporting workmen and materials to Seul Choix Pointe light-station, materials for repairs at Old Mackinac Point, Waugoshance, St. Helena, and Twin River Point light-stations,

**Ninth District.**

1389. *Muskegon Pierhead, Lake Michigan, Michigan.*—On September 11, 1894, a sixth-order lens, illuminating the entire horizon, was substituted for the one of 180 degrees formerly in use in the pierhead light tower. The bell tower and the elevated walk were repaired.

1390. *Muskegon, Lake Michigan, Michigan.*—A brick oil house was built. Various repairs were made.

1391. *Muskegon Lake beacon, Lake Michigan, Michigan.*—A post with platform was erected at the inner end of the entrance to Muskegon Lake, at the extremity of the boom piling. The light was exhibited for the first time May 10, 1895.

— *Grand Haven Pierhead range (front), Lake Michigan, Michigan.*—This light was discontinued May 4, 1895, on account of the removal of the pierhead light to the outer end of the pier. The conduit was taken down and stored for future use.

1392. *Grand Haven Pierhead, Lake Michigan, Michigan.*—This light was moved some 500 feet, to the outer end of the south pier, and reestablished on May 4, 1895, without change of characteristic. One of the fog-signal houses was removed and rebuilt with enlarged capacity, located in the rear of the beacon at the outer end of the pier, and both signals were reestablished June 22, 1895, in one building, without change of characteristic. On April 4, 1895, contract was made for furnishing framing lumber. In April all other materials were ordered for the work of moving the beacon and building an elevated walk, and a working party was sent to the station. A temporary post light was erected at the outer end of the pier. A substructure was built for the fog-signal building. Boiler No. 1 was moved and set up on a brick foundation, the fog-signal apparatus was properly placed, attachments were made to the boilers, and steam was raised on June 22, 1895, when the signal was tested and found to work satisfactorily. A brick foundation was constructed for boiler No. 2, and the boiler was moved into the building. Some 486 running feet of elevated walk were built.

1399. *St. Joseph Pierhead range (front), Lake Michigan, Michigan.*—The elevated conduit from which this light is shown was damaged during a storm on November 13, 1894. A post was temporarily erected at the outer end of the conduit on November 14, and the light was exhibited therefrom. Various repairs was made.

1400. *St. Joseph Pierhead, Lake Michigan, Michigan.*—About 100 running feet of low elevated walk were built. Various repairs were made.

The following statement, made in the Board's last two annual reports, is repeated:

The establishment of a fog signal here, at a cost not to exceed \$5,000, was authorized by the act of February 15, 1893, but no appropriation has yet been made. The Board recommends that the amount named be appropriated.

**Ninth District.**

**1402. Michigan City, Lake Michigan, Indiana.**—The following recommendation, made in the Board's last annual report, is renewed:

The Board is of opinion that a fog signal, operated by steam or hot air, at this station would be a valuable aid to navigation. It is estimated that it could be established for a sum not to exceed \$5,500, and it is recommended that an appropriation of that amount be made therefor.

**1403. Calumet Pierhead, Lake Michigan, Illinois.**—Plans, specifications, and estimate of cost were made for rebuilding the elevated walk, 1,330 feet long, and the construction of a metal tower was contracted for in June, 1895. Bids were opened on May 25, 1895, for furnishing the material required for renewing the elevated walk. Contracts were entered into for furnishing the lumber. Various repairs were made.

**1407. Chicago Pierhead, Lake Michigan, Illinois.**—The old gasoline apparatus in use was replaced with a new plant.

— **South Milwaukee, Lake Michigan, Wisconsin.**—The following statement, made in the Board's last two annual reports, is repeated:

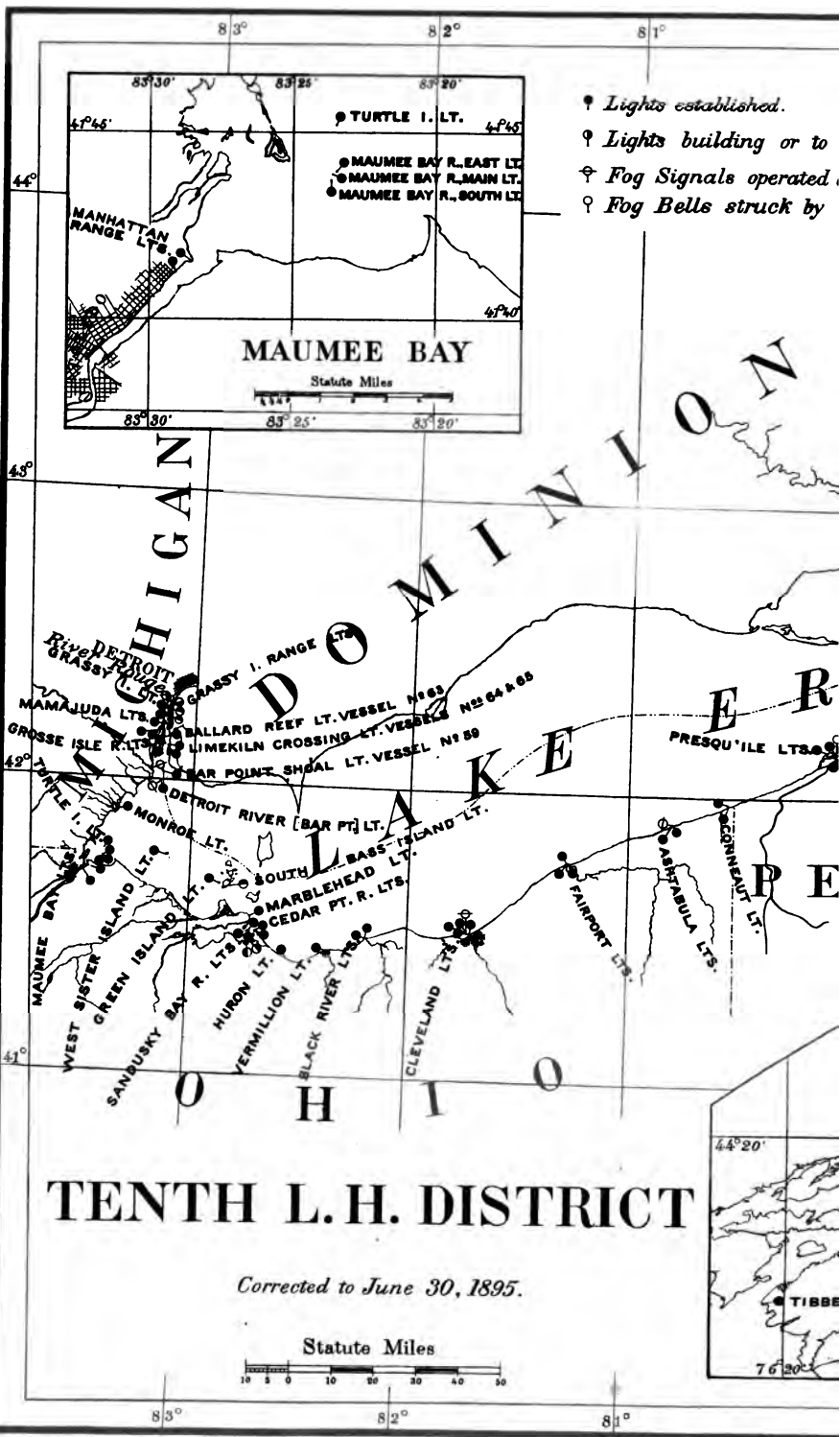
Recommendation was made through the proper channel to Congress in February, 1893, for the establishment of a light at this place. South Milwaukee is a village about 10 miles south of the city of Milwaukee. It is a thriving manufacturing place of some 1,200 inhabitants. There is a large business done here in building materials. It is claimed that it will double its population within a year. The Board is of the opinion that a light should be established on the north pier at the harbor. It is estimated that it will cost, say, \$7,500, and it is recommended that an appropriation of this amount be made therefor.

**1422. Sheboygan Pierhead range (front), Lake Michigan, Wisconsin.**—The elevated conduit for the front range light was damaged by a schooner during a storm, but was rebuilt at once.

**1423. Sheboygan Pierhead, Lake Michigan, Wisconsin.**—An appropriation of \$5,500 was made in the act approved March 2, 1895, for establishing a steam fog signal at this station. Plans and detailed estimate of cost therefor were prepared.

**1425. Manitowoc Pierhead, Lake Michigan, Wisconsin.**—An appropriation of \$5,500 was made by the act approved March 2, 1895, for the establishment of a steam fog signal here. Plans and detailed estimate of cost were made of a fog signal on the pier. Plans and estimate of cost were made for removing the old light-station building, regrading the grounds, and rebuilding the dwelling for the accommodation of two keepers. Contracts were made for furnishing the material for rebuilding the keeper's dwelling, and for furnishing the material for building the fog-signal house.

**1427. Twin River Point, Lake Michigan, Wisconsin.**—The construction of the metal work required to modify the old Chicago River light tower for erection here was completed. All the lumber, tools, and appliances, rubble and crushed stone, cement, and all the old parts of the tower which had been stored at the Chicago River light-station









## TENTH DISTRICT.

This district extends from the mouth of the St. Regis River, St. Lawrence River, New York, to the mouth of the River Rouge, Detroit River, Michigan. It embraces all aids to navigation on the United States shores and waters of Lakes Erie and Ontario and the upper part of the St. Lawrence, the Niagara, and the lower part of the Detroit rivers.

*Inspector*.—Commander James G. Green, United States Navy, to August 15, 1894; since then, Commander Charles V. Gridley, United States Navy.

*Engineer*.—Lieut. Col. Jared A. Smith, Corps of Engineers, United States Army.

In this district there are—

Light-houses and beacon lights.....	72
Light-ships in position.....	4
Fog signals operated by steam.....	6
Fog signals operated by clockwork.....	3
Buoys in position.....	146
Steamer <i>Haze</i> , buoy tender, and for supply and inspection.....	1

All the light-stations and buoys of the district were inspected as frequently as practicable, and the light-stations were supplied with material in May and June.

The engineering work consisted of making repairs and improvements at various light-stations; the construction of range light beacons at Grosse Isle, and above Grassy Island, Detroit River, Michigan; beacons, keeper's dwelling, boathouse, etc., for a range light-station established at Manhattan Point, North Toledo, Ohio; and making plans of structures and doing preliminary work preparatory to the establishment of light-stations at Sandusky Bay, Ohio, and Braddock Point, New York.

## LIGHT-STATIONS.

1073. *Cross-Over Island, St. Lawrence River, New York*.—New boat ways and a crib were built for securing the outer end of the ways. Various repairs were made.

1074. *Sister Islands, St. Lawrence River, New York*.—Some 80 running feet of wooden walk were built. Various repairs were made.

—. *Carlton Island, St. Lawrence River, New York*.—The following statement, made in the Board's last two annual reports, is repeated:

The establishment of this light, at a cost not to exceed \$8,600, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that the amount named be appropriated,

**Tenth District.**

The Board is now of the opinion that this light can be established for \$6,000, and recommends that an appropriation of this amount be made therefor.

*1076. Rock Island, St. Lawrence River, New York.*—The tower, with brick lining 8 inches thick, was raised bodily 5 feet, and under it was built a solid octagonal wall of red granite laid in Portland cement mortar. As the lights from this tower were obscured by the roof of the keeper's dwelling in the direction of Thousand Island Park, a small lantern light with reflector had been shown from the veranda of the dwelling to complete the illumination of the navigable channel. The raising of the tower rendered the small light unnecessary, and it was permanently discontinued in 1894 at the close of navigation. Some 10 linear feet of new wooden walk and 194 running feet of cement walk 3 feet wide were built. Various repairs were made.

*1077. Tibbetts Point, St. Lawrence River, New York.*—By the act approved March 2, 1895, an appropriation of \$4,300 was made for constructing and equipping, complete for service, a fog signal. The proper measures are being taken for doing this work.

*1079. Galloo Island, Lake Ontario, New York.*—The following statement, made in the Board's last two annual reports, is repeated:

The establishment of a steam fog signal, at a cost not to exceed \$5,700, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that the amount named be appropriated.

— *Salmon River, entrance to Port Ontario, Lake Ontario, New York (discontinued).*—This light-house property was sold at public auction as it was a source of care and expense and there was no probability that it would ever be needed again for light-house purposes.

*1081. Oswego, Lake Ontario, New York.*—A section, 125 feet long, of superstructure of the light-house pier at this station was rebuilt. Three or four breaks were found in the foundation, one of them 26 feet long, each being three or four courses under water. Cribs were built, sunk, and filled with stone to fill the spaces in the foundation, thus making it solid. Various repairs were made.

*1083, 1084. Fair Haven, entrance to Little Sodus Bay, Lake Ontario, New York.*—The old part of the dwelling, containing the kitchen and dining room, was taken down and rebuilt, with a porch upon foundations laid up in cement mortar from 5 feet below the surface of the ground. Various other repairs were made.

*1085, 1086, 1087. Big Sodus, at Sodus Point, Lake Ontario, New York.*—Extensive repairs and improvements were made to the keeper's dwelling, much of which was rebuilt. A new picket fence was built about the keeper's dwelling, and about 325 feet of sidewalk were laid. The inner beacon on the west pier was rebuilt upon an improved model. The new beacon is square in plan, painted white; has a balcony with black hand rail and copper ventilating ball above the lantern. The focal plane of

**Tenth District.**

the light is now about 24 feet above the water, instead of 20 feet, as before. The characteristic of the light remains unchanged.

1090. *Braddock Point, Lake Ontario, New York.*—Contract was made for the construction of the keeper's dwelling, tower, and wood shed. It provides for the completion of the buildings within 9 months from June 25, 1895, the date of its approval.

1091. *Oak Orchard, entrance to Oak Orchard Harbor, Lake Ontario, New York.*—Thorough repairs and improvements were made to the keeper's dwelling.

1097. *Horseshoe Reef, entrance to Buffalo Harbor, New York.*—A contract was made for delivering 300 cords of riprap stone at this station. The stone was placed about the station on its most exposed sides.

1098. *Buffalo Breakwater, north end, Lake Erie, New York.*—Complaints having been made that this fog signal when in operation is an annoyance to the people of Buffalo, the characteristic was changed from two blasts of 3 seconds each during each minute, to one blast of 3 seconds each minute, and a reflector was erected upon the signal house and on the land side of the steam whistle. It is a concave structure constructed somewhat on the principle of a parabolic reflector, that it may collect and divert the sound waves from the city and toward the lake.

1099. *Buffalo, main entrance to Buffalo Harbor, New York.*—This station was connected with the Buffalo city waterworks system by laying a 2½-inch pipe, about 275 running feet, across and underneath Buffalo Creek. The old pipe had been broken by a vessel's anchor. The masonry of the tower was repointed in part.

1103, 1104, 1105.—*Presqu'île Pierhead, Erie Harbor, Lake Erie, Pennsylvania.*—A tight board fence 360 feet long was built partly in the water to keep out floating débris. A well was drilled and lined with a 5½-inch casing of galvanized iron pipe.

1106. *Presqu'île, entrance to Erie Harbor, Presqu'île Bay, Pennsylvania.*—Some 14,400 feet of white pine lumber was purchased and delivered near the boathouse to repair the walk leading from the dwelling to the boathouse, a distance of about 1½ miles.

1107. *Conneaut Pierhead, entrance to Conneaut Harbor, Lake Erie, Ohio.*—Some 400 feet of elevated walk were rebuilt on the west pier to provide sure means for reaching the light on the outer end of the pier during storms, when seas wash completely over the pier.

1108. *Conneaut, Lake Erie, Ohio.*—Some 75 feet of hose were provided for washing and fire protection. A fence was built, inclosing the lighthouse premises. A concrete cement walk about 131 running feet long was built. Various repairs were made.

The following recommendation, made in the Board's last annual report, is renewed:

This light was established in 1835, as a guide to vessels entering the harbor of Conneaut, and it was placed on the outer end of the west pier. The commerce of

**Tenth District.**

the place was not maintained and the piers were allowed to decay and fall to ruin. In 1885 the pier was so much decayed that the beacon was insecure and it was removed to the bluff on shore. A new and extensive enterprise is now established at Conneaut, which will probably make it a leading port in the shipment of iron and coal. The harbor is being improved at great expense, and lights to mark the entrance are now important. The old beacon upon the hill, which is of little use as a guide to the harbor or as a coast light, is now so far decayed, except as to the lantern, as to be unfit to move to the pierhead. It is therefore recommended that an appropriation of \$2,500 be made for the construction of a new beacon on the end of the pier, and for a second beacon near the shore to form the rear beacon of a range, the two beacons to be connected by an elevated walk on the west pier. When the range is completed the present lights can be discontinued.

1109, 1110. *Ashtabula, entrance to Ashtabula Harbor, Lake Erie, Ohio.*—Some 633 feet of elevated walk were rebuilt on the west pier. Alterations to the keeper's dwelling under contract were completed. The building of an oil house was authorized, and the brick for its lining was purchased and delivered.

1111. *Fairport main light, mouth of Grand River, Lake Erie, Ohio.*—A roof was built over the covered way, and the old fence about the light-house grounds was replaced. Extensive repairs were made.

1112, 1113.—*Fairport Pierhead (front), mouth of Grand River, Lake Erie, Ohio.*—This beacon, situated on the east pier, was moved northward about 122 feet over a section of the pier recently built to a point about 21 feet from the outer end; and about 134 running feet of elevated walk were built, connecting the beacon with the north end of the old elevated walk. The deck of this new section of the pier being higher than the old part, the focal plane of the light was raised 2 feet above its former height. Various repairs were made.

—*Cleveland, on the hill at the east side of Cleveland Harbor, Ohio (discontinued).*—A fire in the vicinity of this station in December, 1894, damaged the keeper's dwelling and light-house lot, and cracked seven panes of glass in the tower lantern. This required quite extensive repairs to the dwelling. To insure the safety of the  $3\frac{1}{2}$ -order lens still remaining in the tower lantern, the lantern was inclosed with a sheathing of matched boards. The trees and shrubbery killed by the heat were removed; the lawn was reseeded and otherwise improved by new sodding borders of walks and driveway. Some 42 feet of tight board fence and 20 feet of picket fence on the boundary line of the lot were repaired. Various repairs were made.

1115. *Cleveland Breakwater, entrance to Cleveland Harbor, Lake Erie, Ohio.*—About 225 tons of riprap stone were placed around the crib and inside of the pile protection to provide greater security to its structures and to reduce the vibration of the tower during high winds and seas which strike with great force. A fence  $2\frac{1}{2}$  feet high by about 18 feet long was built on the west side of the platform to prevent coal from falling overboard. Various repairs were made.

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The residents of Cleveland were annoyed by the blasts of the whistle. A reflector, therefore, is to be built to carry the sound as far as possible on the lake and reduce it on the land. The characteristic of the signal was changed to 1 blast of 3 seconds per minute instead of 2 per minute.

1116. *Cleveland, east pier, entrance to Cleveland Harbor, Lake Erie, Ohio.*—Some 42 feet of the elevated walk on this pier were removed from the inner end, and 12 feet were rebuilt and provided with steps leading from the pier deck to the deck of the walk. The boathouse received general repairs and was moved back into place. The United States has leased this pier to the Pennsylvania Railroad Company, which is making improvements in the vicinity that will render further maintenance of an elevated walk on the pier within that limit unnecessary.

1118, 1119. *Black River Pierhead range lights, Lake Erie, Ohio.*—The rear beacon was rebuilt at a point farther removed from the channel: The light was first shown from the new tower on August 25, 1894. The steamer *Caledonia* ran into cross-ties under the tower on the outer end of the pier at this station, while entering the harbor on November 2, 1894, moving and doing some injury to the beacon, which was repaired by the steamer's agent. About 60 feet of the inshore end of the elevated walk on the west pier were repaired and rebuilt. On the night of June 24, 1895, the schooner *Mabel Wilson*, while getting out of the harbor, made lines fast to the legs of the elevated walk on the west pier, breaking them and slightly injuring other parts of the walk. Her agent was requested to pay the estimated cost of repair. Various repairs were made.

1124, 1125. *Sandusky Bay range, Lake Erie, Ohio.*—Contracts were made for building the crib foundations, the keeper's dwelling, and both beacons for this light-station, to be completed during the present season. The act approved August 18, 1894, appropriated \$25,000 for moving and rebuilding the range lights and keeper's dwelling. Designs for the buildings and foundations were prepared, contracts were made for the construction of two cribs and stone foundations for the keeper's dwelling and front and rear beacons. The contract for the first-named provides for the completion of the work by October 30, 1895, and that for the second-named by April 1, 1896.

— *South Bass Island, Lake Erie, Ohio.*—By the act approved August 18, 1894, an appropriation of \$8,600 was made for the establishment of this light-station. A lot containing about 2 acres of land on the extreme southwestern point of South Bass Island was purchased for a site. Delay in completing the transfer of this property to the United States was due to the time required by the grantor for the preparation of the abstract of title, so that it was impracticable to commence the erection of the station buildings in this fiscal year.

**Tenth District.**

1134, 1135, 1136. *Maumee Bay ranges, Lake Erie, Ohio.*—The gas-lights of two beacons and the old lantern of another were replaced by lens lanterns, and the main range in the straight channel was modified so that the lights show in both directions. The lights were first exhibited on July 20, 1894, with the new lanterns. The superstructures of the east and main cribs were rebuilt. A contract was made for furnishing stone riprap about the main crib to increase its stability and protect it against ice. An appropriation of \$20,000 was made by the act approved August 18, 1894, for establishing a new beacon at each end of the range, to form a range both outward and inward in the line of the new straight channel in Maumee Bay. As it is insufficient for the purpose no steps have as yet been taken to construct these beacons.

1137, 1138. *Manhattan range lights, Maumee Bay, Lake Erie, Ohio.*—Two wooden beacons, a keeper's dwelling, boathouse, and wood shed were built. The beacons were furnished with illuminating apparatus taken from the discontinued Maumee inner range lights. The lights were first shown in 1895, on the opening of navigation. This range has made the further maintenance of the Maumee outer, middle, and inner ranges unnecessary.

— *Maumee Outer ranges, Maumee Bay, Lake Erie, Ohio.*—On the establishment of the Manhattan range lights at North Toledo, on the opening of navigation, 1895, these lights being of no further use were discontinued. The illuminating apparatus was sent to the Buffalo light-house depot for storage.

— *Maumee Middle range, Maumee Bay, Lake Erie, Ohio.*—The lights of this range were discontinued on the establishment of the Manhattan range lights, and the illuminating apparatus was sent to the Buffalo light-house depot for storage.

— *Maumee Inner range, Maumee Bay, Lake Erie, Ohio.*—A fire destroyed about 300 running feet of the reservation division fence. The front beacon was saved by the local fire department. Buildings reerected close to the boundary line of the light-house lot make it unnecessary to restore that portion of the destroyed fence. The lights of this range were discontinued on the establishment of the Manhattan range at North Toledo, and the illuminating apparatus was transferred to the latter for lighting the beacons of that range.

— *Gibraltar, Michigan (discontinued).*—The buildings and grounds were sold at public auction. The lantern and iron stairway of the tower were reserved.

1145, 1146. *Grosse Isle north channel range lights, Detroit River, Michigan.*—The two beacon lights of this range, completed in June, 1894, were first exhibited on July 16, 1894. At the front beacon a riprap of stone was placed around the pile foundations; iron davits with hoisting gear were placed on the foundation of the beacon. A small frame structure was built on the site of the rear beacon, to be used as a store-

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house and shed, and also as a shelter for the keeper, there being no keeper's dwelling here. The open framework of each of the beacons of this range was inclosed and painted, and a balcony with a hand rail was provided just beneath the lanterns. Four stones were set, one at each corner, to mark the boundaries of the lot purchased for and occupied by the rear beacon. The stones are of granite, 4 feet long, dressed to a surface 8 inches square on top and 6 inches down on each side. In the center of the top of each is drilled a hole, with letters U. S. L. H. E. cut around it. A dwelling is urgently needed for the keeper at this station. There is no place where the keeper can live in the vicinity, and he is now quartered in the wood shed.

The following recommendation was made in the Board's last annual report:

The site was paid for and the beacons were completed, but funds have not permitted the erection of a dwelling. The beacons are situated near the north end of the island, where the houses are almost exclusively owned and occupied by summer residents, and there is no place where a keeper can live within a reasonable distance. The construction of a dwelling is, therefore, essential to the proper maintenance of the lights. A suitable dwelling may be constructed for \$3,500, and an appropriation of that amount is recommended for the purpose.

*1147, 1148. Grosse Isle south channel range lights, Detroit River, Michigan.*—The iron rear beacon was blown over on September 3, 1894, and was completely wrecked above the second lower section. A temporary wooden tower, 78 feet high above the base, was erected without discontinuing the light, which was displayed at various heights as the work progressed. The lights were shown from the temporary structure 79 feet above the river level. The upper two sections of the front beacon were then removed, the target was lowered correspondingly, and the focal plane of the light was fixed at 56 feet above the water level. New beacons were erected upon the same foundations, enlarged by the driving of four additional piles at each.

The beacons were sufficiently advanced in construction to permit the display of both of the lights of the range from the beacon lanterns in 1895 on the opening of navigation. These wooden beacons are square, pyramidal, inclosed, with a gallery below the lantern, and surmounted by an octagonal lantern having three panes of glass and a copper roof. The focal planes of the lights are 30 and 50 feet, respectively, above the mean level of the river. Repairs were made to the lanterns and burners used in the range beacons.

The following recommendation was made in the Board's last two annual reports:

A new dwelling is needed for the keeper of this range. He is now living in a dwelling on Mamajuda, which is not only unsuitable for the purpose but is too far away. It is deemed dangerous for the keeper to live on the side of the channel opposite to the lights. A proper dwelling can be built on a foundation partially in the water for not exceeding \$5,000, and it is recommended that this amount be appropriated for that purpose.

**Tenth District.**

1149, 1150. *Mamajuda Island range light, Detroit River, Michigan.*—The front beacon light, which was completed in June, 1894, was first exhibited by the middle of the following month. This beacon, with the main light, forms a range to keep vessels off the upper shoals between Grassy Island and Mamajuda Island. A layer of stone was placed along the water line of this island to protect it against the wash of the waves and the current of the river. Some 19 cords were placed on the north side, 2 cords on the west side the length of the boathouse, and about 58 cords on the south side. The foundation of the front beacon was surrounded by a riprap of stone to protect the beacon against the ice. Various repairs were made.

1151. *Grassy Island south channel range, on or near Grassy Island, Detroit River, Michigan.*—By the act approved March 2, 1895, an appropriation of \$6,700 was made for completing the lighting of the north and south ends of this island. This beacon in range with Grassy Island light will serve to keep vessels off the south shoals between Mamajuda and Grassy Island.

1152. *Grassy Island, on Grassy Island Shoal, Detroit River, Michigan.*—About 2,380 tons of riprap stone were placed around the island under contract to protect the interior, which was fast washing away by reason of the decay of the wooden sheet piling which encircles the station. .

1153, 1154. *Grassy Island north channel range, Grassy Island, Detroit River, Michigan.*—For the establishment of this and Grassy Island south channel range \$6,700 was appropriated by the act approved March 2, 1895. A survey was made covering an area of 2,400 feet by 200 feet; borings were made to determine the character of the bottom, and the proposed range line was staked out. A map of this survey was prepared.

1155, 1156. *Grassy Island (Ecorse) range lights, Detroit River, Michigan.*—An additional appropriation of \$1,500 for completing these range lights was made by the act approved August 18, 1894. Two inclosed wooden beacons were built by a contract which required their completion by June 30, 1895. When the illuminating apparatus is put into the lanterns of the beacons, they will be ready for lighting. A riprap protection work of stone was placed around the foundations of the beacons. The lights of this range are located on the flats, in water about  $3\frac{1}{2}$  feet deep, in front of a wide marsh. The nearest place where a keeper could reside is in the village of Ecorse, about three-fourths of a mile distant in a direct line. If he should live there it would be necessary to row fully a mile. This would be quite difficult at times, as the ice forms and remains in the shallow water while the main channel is open. The light-house reservation, which is 100 feet wide and about 700 feet long, is entirely submerged, and the bottom is so soft that a secure foundation can be had only upon piles protected with riprap



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stone. It is indispensable to the proper care of this station that the keeper live on its site. This can be made possible only by the erection here of a keeper's dwelling. It is estimated that a suitable one can be erected for \$5,000 and it is recommended that an appropriation of this amount be made therefor.

**REPAIRS.**

At each of the following-named stations repairs, more or less extensive, were made during the year:

1072. Ogdensburg, N. Y.

1077. Tibbetts Point, N. Y.

1078. Sacketts Harbor, N. Y.

1079. Galloo Island, N. Y.

1080. Stony Point, N. Y.

1082. Oswego Breakwater, N. Y.

1088, 1089. Genesee, N. Y.

1092. Thirty-Mile Point, N. Y.

1095. Niagara River range, N. Y.

1098. Buffalo Breakwater, N. Y.

1100, 1101. Dunkirk, N. Y.

1102. Erie, Pa.

1109. Ashtabula, Ohio.

1115. Cleveland Breakwater, Ohio.

1120. Vermilion, Ohio.

1121. Huron, Ohio.

1122, 1123. Cedar Point, Ohio.

1126, 1127, 1128. Sandusky Bay ranges, Ohio.

1139. Monroe, Mich.

1141. Detroit River (Bar Point), Mich.

**LIGHT-VESELS.**

1140. *Bar Point light-vessel, No. 59, Lake Erie, Michigan.*—This vessel was removed from her station December 11, 1894, and placed in winter quarters at Detroit. She was returned to her station on April 9, 1895. She is in good condition.

1142. *Limekiln Crossing light-vessel (south), No. 64, Detroit River, Michigan.*—This vessel was removed from her station on December 11, 1894, and placed in winter quarters at Detroit. On April 10, 1895, she was replaced on her station. She is in good condition.

1143. *Limekiln Crossing light-vessel (north), No. 65, Detroit River, Michigan.*—This vessel was removed from her station on December 11, 1894, and placed in winter quarters at Detroit. On April 10, 1895, she was replaced on her station. She is in good condition.

1144. *Ballard Reef light-vessel, No. 63, Detroit River, Michigan.*—This vessel was removed from her station on December 11, 1894, and was placed in winter quarters at Detroit. On April 10, 1895, she was replaced on her station. She is in good condition.

**FOG SIGNALS OPERATED BY STEAM OR HOT AIR.**

1088. *Genesee, Lake Ontario, New York.*—This 6-inch steam whistle was in operation some 220 hours, consuming about 10 tons of coal.

1098. *Buffalo Breakwater (north end), Lake Erie, New York.*—This 10-inch steam whistle was in operation some 541 hours, consuming about 35 tons of coal. On June 1, 1895, the interval between blasts was increased from 27 seconds to 57 seconds. A sounding board is being erected to throw the sound toward the lake and from the city.

**Tenth District.**

1109. *Ashtabula, Lake Erie, Ohio.*—This 6-inch steam whistle was in operation nearly 155 hours, consuming 8 tons of coal.

1115. *Cleveland Breakwater (east end), Lake Erie, Ohio.*—This 10-inch steam whistle was in operation some 863 hours, consuming nearly 47 tons of coal. A modification of the characteristics of this fog signal, similar to the one reported at the Buffalo Breakwater signal, will soon be made.

1140. *Bar Point light-vessel, No. 59, Lake Erie, Michigan.*—This 6-inch steam whistle was in operation some 200 hours, consuming nearly 8 tons of coal.

1141. *Detroit River (Bar Point), Lake Erie, Michigan.*—This steam whistle was in operation nearly 264 hours, consuming about 15 tons of coal.

The three fog bells of the district are in good condition, and the machinery operating them is working well.

**BUOYAGE.**

The buoyage of the district is in good condition. The light-house tender *Haze* cared for the buoys in Lake Erie and Detroit River, and placed those in Niagara River. Eleven new buoys were placed, one in the straight channel of Maumee Bay, Ohio, opposite the crib in Sandusky Bay, Ohio, and two in the outer channel at Sandusky, Ohio. Six unlisted dock-channel buoys were placed in Sandusky Bay, also an unlisted buoy near the sunken cribwork of Buffalo Breakwater. Seventeen buoys were discontinued in the old channel at Sandusky, Ohio. On June 25, 1895, two gas buoys and an ice buoy were received from the general light-house depot.

**DEPOTS.**

*Rock Island, New York.*—No repairs were made. The depot is in fair condition.

*Buffalo, N. Y.*—A dredging plant was employed in dredging in front of the buoy house at this place, and in the slip occupied by the light-house tender *Haze* to provide sufficient depth of water for the tender to reach her berth without taking ground. A depth of 13 to 14 feet of water was obtained in front of the dock, and in the slip, up to within 50 feet from the head.

*Erie, Pa.*—The roof of the buoy house was reshingled. The depot is now in fair condition.

*Sandusky, Ohio.*—The construction of a buoy house at Cedar Point is under contract. The buoy house is in poor condition.

*Maumee Bay, Ohio.*—No repairs were made.

**Tenth District.****TENDER.**

*The Haze.*—This screw steamer is in fair condition, considering that she is 21 years old. Repairs are necessary each year, particularly to her engine and boiler, the latter of which is in such a condition that it may become useless at any moment. Continued patching is necessary. She has been employed during the year in caring for the buoyage of Lake Erie and Detroit River, in painting and whitewashing the depot buildings, fences, and buoy sheds, in making inspections, and in landing supplies at light-stations. She went into winter quarters on December 20, 1894, when most of her crew was discharged. She left Detroit April 9, 1895, on the buoy trip, and to place the light-vessels and after completing that work, began, on May 21, the supply of the stations, finishing on June 23, 1895. During the year she ran some 5,869 miles, consuming about 271 tons of coal.

## ELEVENTH DISTRICT.

This district extends from the mouth of the River Rouge, Detroit River, Michigan, to the westerly end of Lake Superior. It embraces all aids to navigation on the United States shores and waters of Lakes St. Clair, Huron, and Superior, the upper part of the Detroit River, the St. Clair and St. Marys rivers, and that part of the Straits of Mackinac lying to the eastward of a line drawn across the straits just to the eastward of Old Mackinac Point light-station, Michigan.

*Inspector.*—Commander William W. Mead, United States Navy.

*Engineer.*—Maj. Milton B. Adams, Corps of Engineers, United States Army.

There are in the district—

Light-houses and beacon lights, including 18 post lights.....	165
Light-ships in position.....	3
Day or unlighted beacons.....	1
Fog signals operated by steam.....	24
Fog signals operated by clockwork.....	4
Bell buoys in position.....	2
Other buoys in position.....	322
Steamer <i>Marigold</i> , buoy tender, and for supply and inspection.....	1
Steam barge <i>Warrington</i> , buoy tender, and for construction and repair.....	1
Steamer <i>Amaranth</i> , for construction and repair.....	1
Steam launch <i>Lotus</i> , for construction and repair.....	1
Launch of <i>Amaranth</i> , for construction and repair.....	1

## LIGHT-STATIONS.

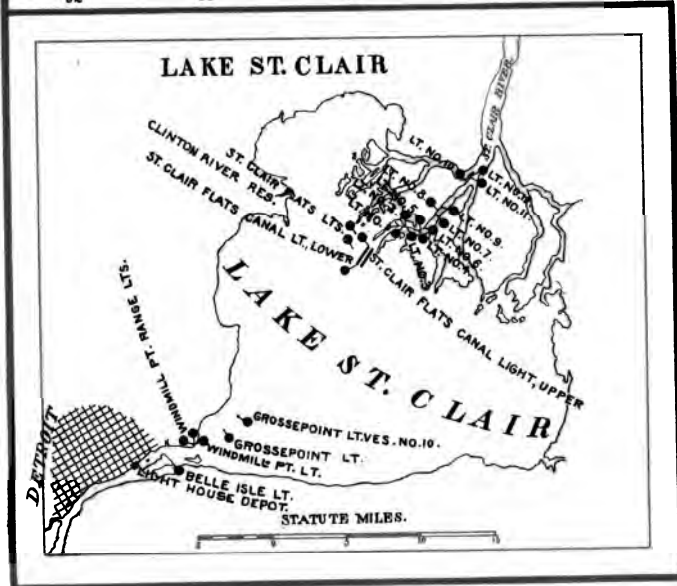
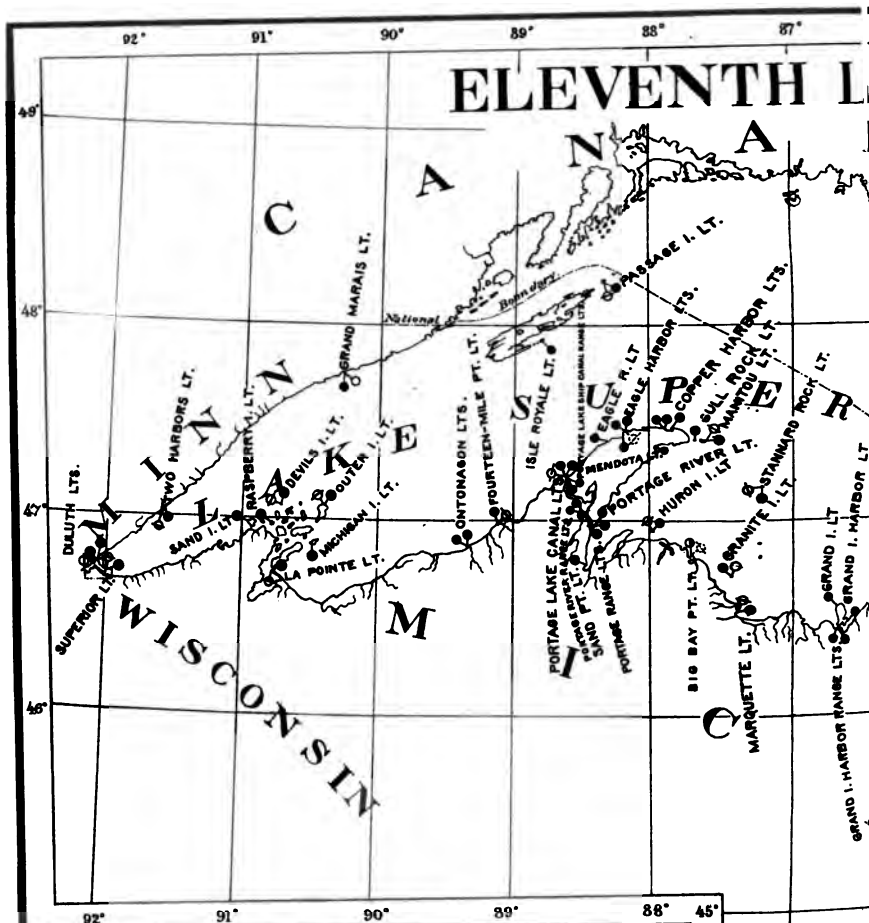
1160. *Windmill Point, Detroit River, Michigan.*—The roadway leading from the right of way through the station was covered with 200 cubic yards of sand and graded. Minor repairs were made.

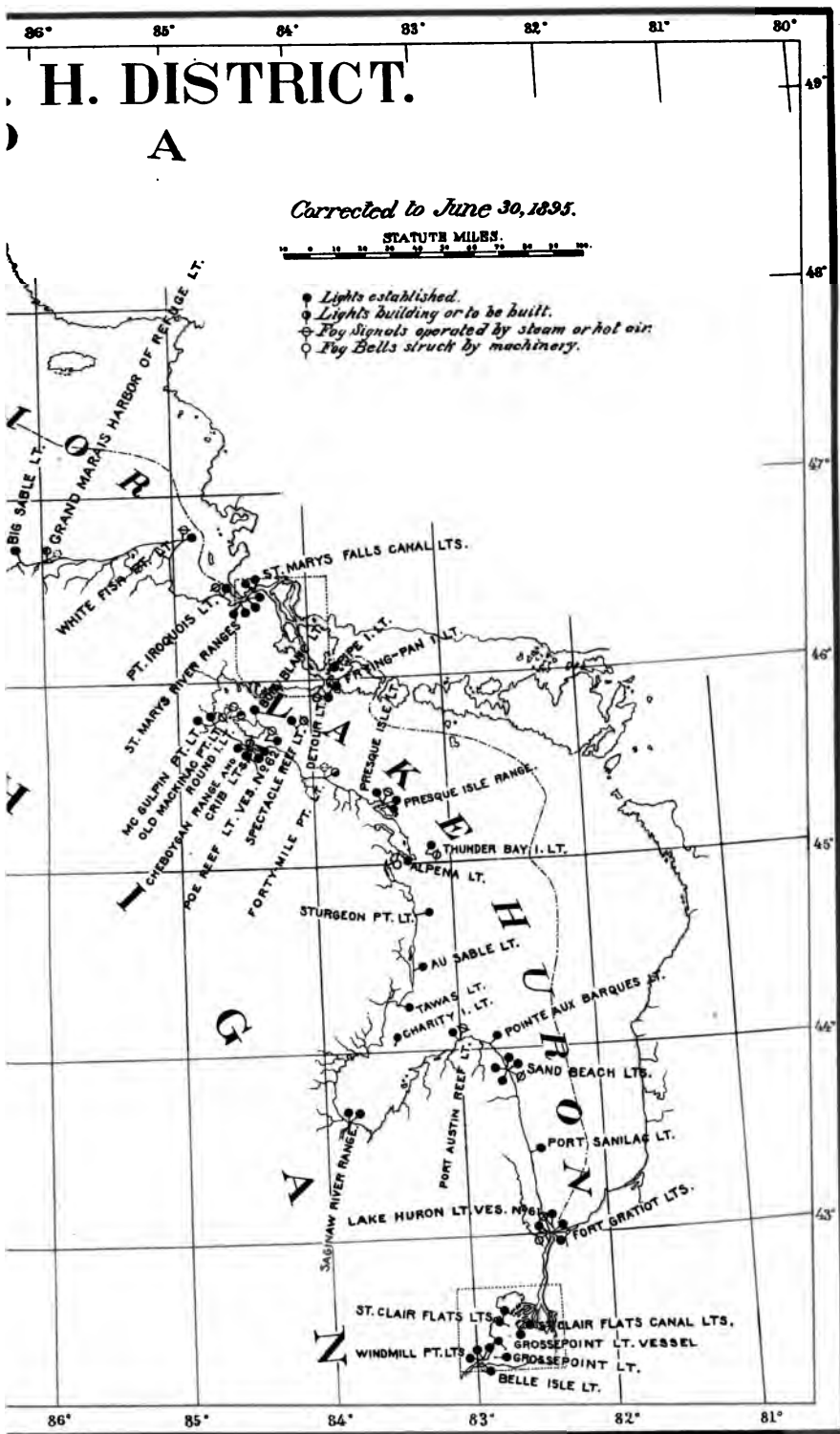
1163–1172. *St. Clair River beacon and range lights.*—Some trouble has been experienced with some of the Funck lanterns when there is a strong wind. The piles forming the cluster known as Middle No. 5 will require redriving; in other respects these lights are in good condition.

— *Lake St. Clair lights, Michigan.*—The new 20-foot channel begins at a point  $1\frac{1}{2}$  miles ENE. of Windmill Point and runs NE.  $\frac{1}{4}$  E. about  $6\frac{3}{4}$  miles, where the natural depth of water is something over 20 feet. This portion of the channel, when completed, is to be 800 feet wide, with a mean depth at low water of 20 feet.

The dredged channel again begins at a point  $2\frac{1}{4}$  miles SW.  $\frac{3}{4}$  S. from the southern entrance to the ship canal, but decreases in width as the











**Eleventh District.**

canal is approached. This upper stretch is now fairly marked by the St. Clair Flats Canal lights, but it is believed to be necessary to have additional lights at the southern entrance to this cut, as in thick weather vessels of extreme draft would have difficulty in finding it, and it is therefore proposed that two gas buoys be placed there.

The best way of lighting the lower stretch would seem to be by placing range lights on the prolongation of the axis of the channel, but this is impracticable, as it would place the lights on Canadian soil. The only other practicable means of lighting it will be by establishing crib lights along the edge of the cut. It is therefore proposed to place a crib with a keeper's dwelling on the western edge at the southwest end of this cut at a point  $1\frac{1}{2}$  miles ENE. from Windmill Point, from which to exhibit a proper light. About a mile NE.  $\frac{1}{4}$  E. from this spot another crib should be placed, from which to exhibit a small light. On the opposite side of the dredged cut, and at a point about  $1\frac{1}{2}$  miles to the northeastward from the second crib, it is proposed to place a third crib, from which to exhibit two lens lanterns, one white and one red. To mark the northeastern end of this cut it is proposed to place Grossepoint light-vessel, and moor her on the eastern edge of the channel. With the establishment of these lights there will be no further need for the Grossepoint beacon. It is estimated that this new dredged channel can be lighted in the manner proposed for not exceeding \$20,000, and it is recommended that an appropriation of this amount be made therefor.

*1181. Fort Gratiot, Lake Huron, Michigan.*—A change in the characteristics of the fog signal was made on the opening of navigation, 1895. Defective fog-signal boiler No. 1 was taken down and replaced with a new Roberts boiler. The old engine was also placed on a brick foundation for use in connection with this boiler and pipe connections were made. An iron hand railing was placed in the tower. The light-house reservation was entirely inclosed with a new fence and the marshy places on the west side were filled up. Various repairs were made.

*1197. Thunder Bay Island, Lake Huron, Michigan.*—The boathouse and boat ways were thoroughly rebuilt. Various repairs were made.

*1201. Forty-Mile Point, Lake Huron, Michigan.*—An appropriation of \$25,000 was made for the establishment of a light and fog signal here by the act approved August 18, 1894. Negotiations for the purchase of the site were begun in September. The offer to sell a site for a light-station for \$200 was accepted. Contracts were made for two fog-signal boilers, and the boilers are now under construction. Preliminary plans, general description, and detailed estimate of cost of the light-house tower and keeper's dwelling, with other buildings for this light-station, were made.

*1202. Spectacle Reef, Lake Huron, Michigan.*—The foundation crib, which was damaged by ice, was thoroughly repaired. Various other repairs were made.

**Eleventh District.**

1203. *Detour, Lake Huron, Michigan.*—The material required for converting the old unused fog-signal house into a barn was purchased and delivered. Contracts were entered into for one fog-signal boiler. Various repairs were made.

1204. *Round Island, Straits of Mackinac, Lake Huron, Michigan.*—An appropriation of \$15,000 was made in the act approved August 18, 1894, for the establishment of a light and steam fog signal on this island. Plans, specifications, and estimate of cost for a light and fog-signal station were prepared and contracts were made for two fog-signal boilers. Detailed plans and specifications for the metal work, and detailed plans of the buildings, with specifications for the erection of the station were made. Contracts were made for the completion and delivery of the metal work for this light-station, and for the construction and erection of the light and fog signal.

1207. *Cheboygan, Straits of Mackinac, Michigan.*—A well was driven and provided with a galvanized-iron tank. Minor repairs were made.

1209. *Cheboygan River range (front), Straits of Mackinac, Michigan.*—A walk was laid from the dwelling to the river. A walk 11 by 33 feet was built, the fences were repaired, and two legs of the tower were spliced to renew the lower portions, which were decayed. Various repairs were made.

1213-1255. *St. Marys River lights, from Pipe Island to Sault Ste. Marie, Michigan.*—Negotiations to obtain full title to the leased sites upon which Harwood Point range, East Neebish range, Indian Point range, and Partridge Point and Topsail Island ranges are erected have been pending since July, 1894. Various repairs were made. These lights are in good condition and well cared for with the following exceptions:

*Lower Lake George.*—The capsized crib on which has been erected the post on which the lantern is hoisted will probably not last through another winter and will have to be replaced.

*Middle Lake George.*—The crib on which the keeper's house and light stand is listed over to the westward, but is still serviceable. The lanterns in use were repaired.

*Upper Lake George.*—The crib on which the light stands is listed over considerably to the southward, but is still serviceable.

*Church Point.*—The crib is listed over to the northeast, but is still serviceable.

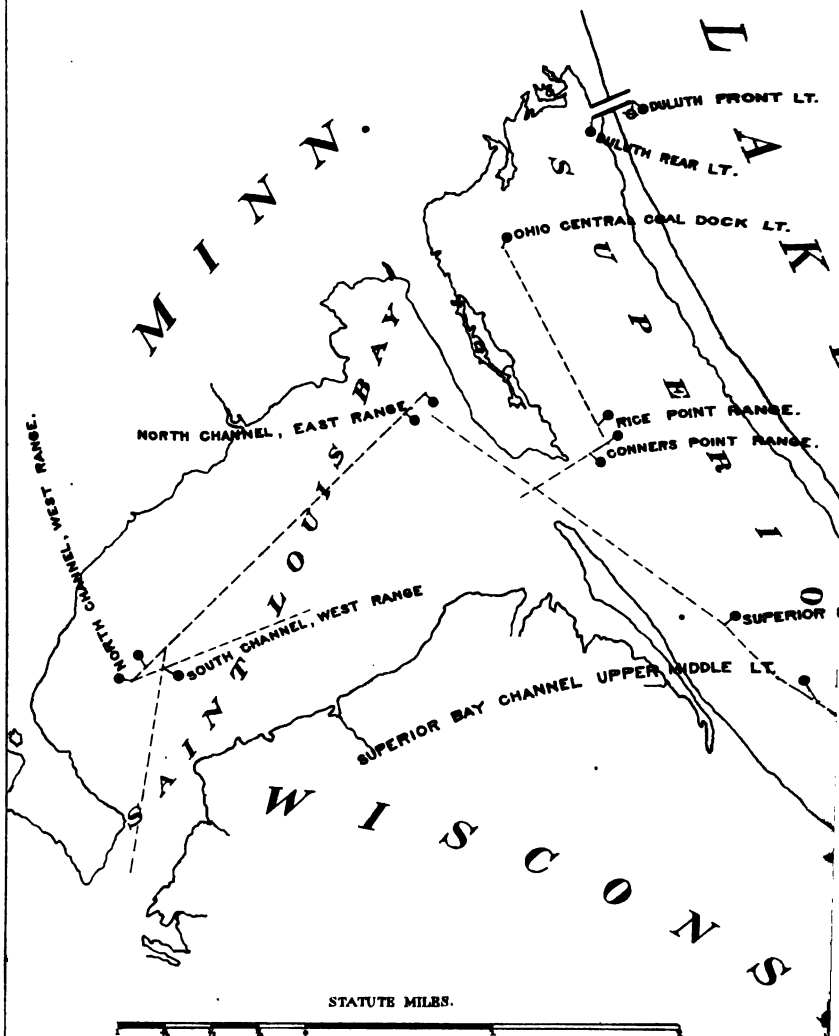
A light was established at Churchville Point during the season of 1894 and is in good condition.

1215, 1216. *Pilot Island range, St. Marys River, Michigan.*—These ranges were established and the lights were shown on October 15, 1894, for the first time. Material was purchased for a watch room and was delivered at Pilot Island by the *Amaranth*.



# ENLARGED PARTS OF ELEVENTH L. H. DISTRICT

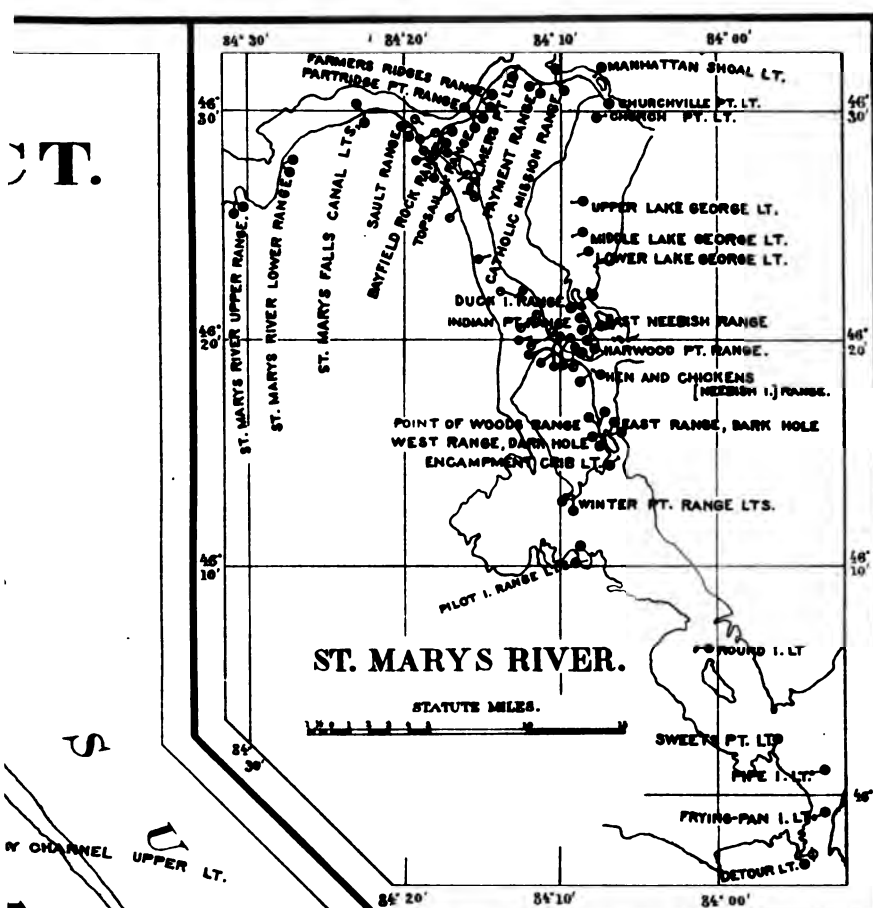
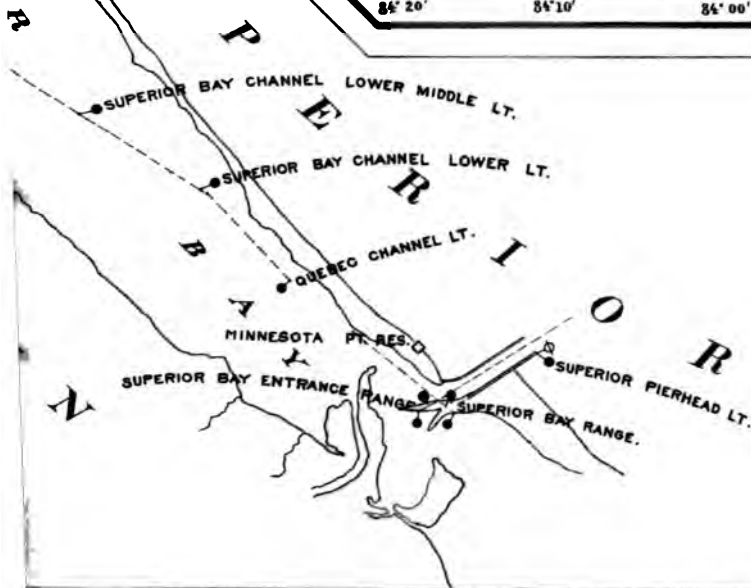
*Corrected to June 30, 1895.*

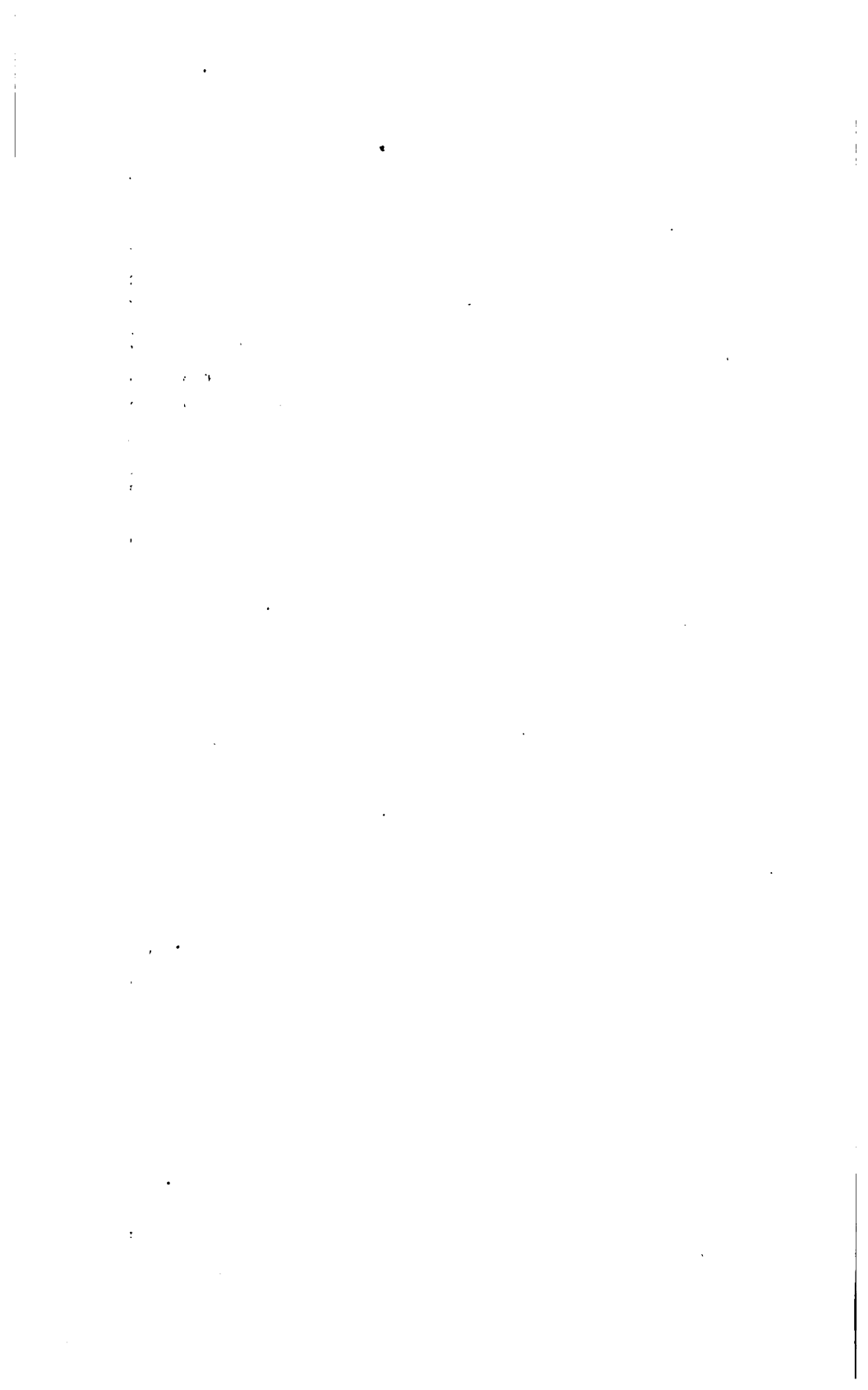


- Lights established.
- ◐ Lights building or to be built.
- ⊕ Fog Signals operated by steam or hot air.
- Fog Bells struck by machinery.

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**Eleventh District.**

1218. *Winter Point range (rear), St. Marys River, Michigan.*—The construction of the foundation piers and moving the light-tower back across the peninsula were completed. The tower was moved November 15, 1894, from the old to the new site, a distance of 545 feet, making the distance between the ranges 675 feet. A brick foundation was laid for the oil house and the structure was moved 505 feet and placed. Some 545 feet of footwalk 2 feet wide, elevated on cedar posts, were built, connecting the front and rear lights. Material was purchased for inclosing the foundation of the dwelling, constructing a foundation pier, and repairing the roof of the dwelling.

1236-1238. *Lake George Cribs, St. Marys River, Michigan.*—A contract was made for furnishing the lumber for leveling and repairing the cribs.

1240. *Churchville Point, St. Marys River, Michigan.*—This light was established and was shown on October 1, 1894, for the first time.

1256-1280. *Hay Lake Channel, St. Marys River, Michigan.*—The act approved August 18, 1894, provided \$43,550 for lighting Hay Lake Channel. Plans with estimate of cost for building five new cribs and for erecting a superstructure on an old substructure were made and the lowest bids were accepted. The stone required for the foundations of the five cribs was purchased and 395 cords placed at the various sites. A careful survey of the channel was made, and all sites were sounded and locations buoyed. Plans, specifications, and detailed estimates of cost for all of the proposed structures were made. A design for a skeleton tower for ranges on that channel, with general description and calculations, was made.

Negotiations relative to the purchase of the sites upon which to erect light-stations were instituted, and title papers to a site at Six-Mile Point were obtained and forwarded April 8 to the United States attorney for his opinion. The deed for the land required for the site for the rear range at Six-Mile Point was recorded. Contracts were made for furnishing the material for the erection of light-stations and other supplies. Material was purchased and loaded on to the tender *Warrington* for delivery and a working party was organized, ready to begin operations early in May. Bids were opened April 15 for furnishing and delivering seven skeleton iron towers and contracts for furnishing these towers were made. The material for the work was unloaded in May at the proper stations by the tender *Warrington* and stored; a camp was built, including cook house, mess room, place for storage of tools, sleeping quarters for the men, etc., at the head of Neebish Island. At lot No. 3 the site for the keeper's dwelling was cleared and drained, the cellar excavated, cement footings laid, a drain put in, and the building of lamp houses for stations Nos. 2, 4, and 6 was begun. The framing of the cribs at Sault Ste. Marie was well advanced. Cribs Nos. 17 and 19 were completed and towed to their respective sites and crib

**Eleventh District.**

17 was sunk in place, filled with ballast stone, and banked around the outside with riprap stone.

During June stations Nos. 2, 4, and 6 on the dike were completed. At station 7 the crib was sunk in place and ballasted and the greater portion of the oak planking was done. At station 9 the crib was sunk in place and ballasted to water level. At Nine-Mile Point the crib was towed to the site and anchored. At stations 17 and 18 the cribs were completed. At stations 19 and 21 the piles for the foundations were driven and the materials for the construction of the foundation superstructures were delivered at the sites. At station 20 bricks were delivered for the foundation piers for the tower. Station 22 was completed, and at stations 22 and 24 posts and lamphouses were completed, ready to place, and the crib for station 25 was completed, ready to tow to the site.

1282. *St. Marys Falls Canal, south pier, St. Marys River, Michigan.*—The iron tower, which was shifted out of plumb by a collision with the schooner *H. A. Hagood*, was replaced in position. Various repairs were made.

1288. *Whitefish Point, Lake Superior, Michigan.*—The materials for alterations and additions to the keeper's dwelling were purchased and delivered. The materials for repairs to the sidewalks and to the foundation of the keeper's dwelling and the supplies for the working party at this station were landed and stored, and a camp was established, consisting of cook house, mess room, house for storage of tools, and quarters for the men. The work was finished in June, 1895. The characteristics of the light-tower were changed from brown to white, that it might be more prominent as a day mark.

1289. *Grand Marais harbor of refuge, Lake Superior, Michigan.*—The act approved March 2, 1895, provided \$15,000 for a light and bell at this harbor. Preliminary plans, general description of buildings, and an estimate of cost for a light-station were made.

1290. *Big Sable, Lake Superior, Michigan.*—A brick oil house with metal roof, door, and shelving was built.

The following statement, made in the Board's last two annual reports, is repeated:

The establishment of a steam fog signal here, at a cost not to exceed \$5,500, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that the amount named be appropriated.

1296. *Marquette Breakwater, Lake Superior, Michigan.*—This light tower was moved to the end of the breakwater and a new foundation and cellar for the carbureter of the gasoline machine was built at the end of the breakwater. Connections were made with the gasoline machine and the light was again shown on October 1, 1894, from the tower in its new position.



**Eleventh District.**

1298. *Big Bay Point, Lake Superior, Michigan.*—An appropriation of \$25,000 was made in the act approved August 18, 1894. An offer to sell a site was accepted, and request was made for the necessary title papers. Contract was made for furnishing two fog-signal boilers.

1305-1308. *Portage Lake and River, Michigan.*—The four post lights for the lighting of this lake and river, heretofore in charge of the War Department, were transferred to and taken charge of by the Light-House Establishment on October 27, 1894.

1309. *Mendota, Bete Grise Bay, Lake Superior, Michigan.*—An appropriation of \$7,500 was made by the act approved March 2, 1895, for this station. Plans, general description, and estimates of cost of a keeper's dwelling and a light were made.

1310. *Manitou, Lake Superior, Michigan.*—A brick oil house was erected. The illuminating and fog-signal apparatus was overhauled and repaired. Various repairs were made.

1312. *Copper Harbor, Lake Superior, Michigan.*—A boat landing was built. A barbed-wire fence was stretched across the point of the light-house reservation.

1315. *Eagle Harbor, Lake Superior, Michigan.*—The illuminating apparatus was overhauled and repaired. The act approved March 2, 1895, provided \$5,000 for the establishment of a fog signal here. Plans and detailed estimate of cost of its establishment were made.

1316, 1317. *Eagle Harbor range, Lake Superior, Michigan.*—About 1,000 running feet of plank foot walk, elevated 2 feet above the marsh, and connecting the front and rear range, were renewed. Minor repairs were made.

1320. *Portage Lake Ship Canal Pierhead, Lake Superior, Michigan.*—A portion of the elevated walk and the bridge connecting the walk at the angle of the pier were carried away on September 30 by a storm. The bridge, which is 35 feet long, was rebuilt, 100 feet of the walk renewed, and the hand and foot railing and plank for the entire length of the walk were replaced. The act approved March 2, 1895, provided \$5,500 for establishing a fog signal at this station. Plans and detailed estimate of cost of establishing a fog signal were made. Plans and detailed estimate of cost were made for converting the present bell tower into a beacon tower, by the addition of an upper story, and surmounting it with a cast-iron deck and lantern, and for constructing 150 running feet of elevated walk. The lumber for converting the bell tower into a beacon and for building an elevated walk was purchased.

— *Portage Lake and River, lighting and buoying, Lake Superior, Michigan.*—The following statement, made in the Board's last annual report, is repeated:

A joint report recommending the lighting and buoying of this lake and river was transmitted by the inspector and engineer of the Eleventh light-house district on November 10, 1893.

**Eleventh District.**

The following is a recapitulation of the lights therein recommended:

- (1) One tubular-lantern (white) light on south end of east pier of ship canal.
- (2) One lens-lantern (8-day white) light on crib near mouth of Pilgrim River.
- (3) Range, two tubular lanterns (white) at head of Portage River.
- (4) Range, two tubular lanterns (white) on Princess Point.
- (5) Three pile clusters, with red lanterns, to mark channel around Princess Point.
- (6) Possibly an additional white light to form range with pile cluster light.
- (7) Range, two tubular lanterns (white) to mark channel through cuts Nos. 2, 3, and 4.
- (8) Range, two tubular lanterns (white) to lead through channel past Halles Landing.

The above lights, if established, will, it is believed, render the navigation of Portage Lake and River feasible and safe at night. For the construction of the above, the fitting and supplying of the necessary buoys, 60 in number, maintenance of the system, etc., for one season, the purchase of sites and the construction of two suitable dwellings, an appropriation of \$10,500 is recommended.

*1321. Fourteen-Mile Point, Lake Superior, Michigan.*—This light was established on October 15, 1894. The buildings were completed by the end of the fiscal year.

*1324. Outer Island, Apostle Group, Lake Superior, Wisconsin.*—A brick oil house was erected, with iron roof, door, and shelving, located 60 feet southwest of the dwelling.

*1325. Michigan Island, Apostle Group, Lake Superior, Wisconsin.*—A brick oil house was erected with metal roof, door, and shelving, located 75 feet west of the dwelling. Various repairs were made.

*1327. Chequamegon light and fog signal, Lake Superior, Wisconsin.*—The act approved March 2, 1895, provided \$10,000 for moving and rebuilding the main La Pointe light and establishing a harbor bell and light at or near Chequamegon Point. Negotiations for the purchase of a site at the extreme point are in progress.

*1329. Devils Island, Apostle Group, Lake Superior, Wisconsin.*—The title papers to this island were recorded in the proper office. Cession of jurisdiction was obtained from the State of Wisconsin. The completing of this light-station, at a cost not to exceed \$22,000, was authorized by the act approved February 15, 1893, but no appropriation was then made. The act approved March 2, 1895, appropriated \$22,000 "for constructing a permanent tower." As the completion of the station demands, in addition to the permanent tower, the building of additional quarters for keepers, and the purchase of a third-order lens to fully carry out the design, it is feared that under the wording of the act the work can not be done, as in order to do it economically the tower and dwelling should be built at one time. Recommendation is therefore made that the appropriation available for the completion of the station be made to include the erection of an additional keeper's dwelling.

**Eleventh District.**

*1332-1349. Superior Bay and St. Louis Bay post lights, Wisconsin and Minnesota.*—The 18 post lights established here in 1893 were destroyed either by ice during the winter or by passing rafts during the season of navigation. Steps should be taken to provide more substantial structures. An appropriation of \$1,200 was made by the act approved August 5, 1892, for establishing post lights from Superior Bay entrance to Connors Point. This money is still available for this purpose.

*1350, 1351. Duluth range, Lake Superior, Minnesota.*—A parabolic reflector was built to deaden the sound of the fog signals on the landward side. To do this the position of one of the whistles was changed where it passes through the roof and a platform was built just above the ridge of the house. On this platform the reflector was built, with a series of arches made of 2-inch stuff running from the face to the back, giving a solid joint for nailing on sheet iron. The entire surface was covered with heavy sheet iron and the whole apparatus was inclosed in a box filled with sawdust.

After the reflector was placed trials were made to test its efficiency, with favorable results. The two whistles were sounded alternately, the one under the reflector and the one not covered. The sound from the open whistle was very weak 12 minutes after the departure of the boat from Duluth, and 15 minutes after was inaudible, while the sound from the other whistle became very weak after 16 minutes and inaudible 26 minutes thereafter. The boat was running about one-sixth of a mile a minute, consequently the open whistle was inaudible over 2 miles away and the one with reflector could be heard 4 miles away. It must therefore be assumed that the intensity of the sound toward the shore has been much reduced by the reflector. This belief is strengthened by the fact that no further complaints have been received from the residents of Duluth. Various repairs were made.

*1352. Two Harbors, Lake Superior, Minnesota.*—Plans and specifications were prepared for converting the barn into a dwelling for the assistant keeper and contracts therefor were made.

*1353. Grand Marais, Lake Superior, Minnesota.*—The act approved March 2, 1895, provided \$4,000 for the purchase of a site and the building of a light-keeper's dwelling here out of the unexpended balance of the appropriation made in the act approved March 3, 1885. An offer of a site for a keeper's dwelling was accepted and steps are now being taken to obtain title thereto.

**Eleventh District.****REPAIRS.**

More or less extensive repairs were made at each of the following stations during the year:

1157. Belle Isle, Mich.	1211. Frying-Pan Island, Mich.
1164. St. Clair Flats range (rear), Mich.	1212. Pipe Island, Mich.
1165. St. Clair Flats Canal, lower, Mich.	1283, 1284. St. Marys River range (lower), Mich.
1167-1178. St. Clair River lights, Mich.	
1179, 1180. Fort Gratiot range, Mich.	1287. Point Iroquois, Mich.
1183. Port Sanilac, Mich.	1291. Grand Island, Mich.
1184. Sand Beach, east entrance, north main light, Mich.	1295. Marquette, Mich.
1188. Pointe aux Barques, Mich.	1299. Huron Island, Mich.
1189. Port Austin Reef, Mich.	1300. Stannard Rock, Mich.
1190. Saginaw River range (front), Mich.	1301. Sand Point, Mich.
1192. Charity Island, Mich.	1311. Gull Rock, Mich.
1193. Tawas, Mich.	1313, 1314. Copper Harbor range, Mich.
1195. Sturgeon Point, Mich.	1319. Portage Lake Ship Canal, Mich.
1196. Alpena, Mich.	1322. Ontonagon, Mich.
1198, 1199. Presque Isle Harbor range, Mich.	1326. La Pointe, Wis.
1200. Presque Isle, Mich.	1330. Sand Island, Wis.
1205. Bois Blanc, Mich.	1331. Superior Pierhead, Wis.
	1354. Isle Royale, Mich.
	1355. Passage Island, Mich.

**LIGHT-SHIPS.**

1162. *Grossepont light-vessel, No. 10, Lake St. Clair, Michigan.*—This vessel was slightly repaired while laid up during winter months; a new windlass was placed in her and her outside planking was put in order. She is quite old and will not be serviceable much longer.

1182. *Lake Huron light-vessel, No. 61, at the foot of Lake Huron, Michigan.*—Slight repairs were made during the winter months. She is now in good condition.

1206. *Poe Reef light-vessel, No. 62, Straits of Mackinac, Michigan.*—Some slight repairs were made during the winter months. She is now in good condition.

The following, which appeared in the Board's last two annual reports, is renewed:

The establishment of a light-ship on this station, at a cost not to exceed \$25,000, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that the amount named be appropriated.

A cheaply built vessel which is needed elseywhere is maintained at Poe Reef pending the appropriation which was authorized, but was not made, by the act approved February 15, 1893.

**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

1181. *Fort Gratiot, Mich.*—This 8-inch steam whistle was in operation some 205 hours, and consumed about 10 tons of coal.

**Eleventh District.**

1182. *Lake Huron light-vessel, Michigan.*—This 6-inch steam whistle was in operation some 249 hours, and consumed about 11 tons of coal.

1184. *Sand Beach (harbor of refuge) north main light, Michigan.*—This 10-inch steam whistle was in operation some 313 hours, and consumed about 27 tons of coal.

1189. *Port Austin Reef, Michigan.*—This first-class steam siren was in operation some 279 hours, and consumed about 22 tons of coal.

1197. *Thunder Bay Island, Michigan.*—This 10-inch steam whistle was in operation some 306 hours, and consumed about 18 tons of coal.

1200. *Presque Isle, Michigan.*—This 10-inch steam whistle was in operation some 359 hours, and consumed about 26 tons of coal.

1202. *Spectacle Reef, Michigan.*—This 10-inch steam whistle was in operation some 318 hours, and consumed about 14 tons of coal.

1203. *Detour, Mich.*—This 10-inch steam whistle was in operation some 375 hours, and consumed about 22 tons of coal.

1206. *Poe Reef light-vessel, Michigan.*—This 6-inch steam whistle was in operation some 519 hours, and consumed about 25 tons of coal.

1207. *Cheboygan, Mich.*—This 10-inch steam whistle was in operation some 413 hours, and consumed about 33 tons of coal.

1287. *Point Iroquois, Michigan.*—This 10-inch steam whistle was in operation some 412 hours, and consumed about 21 tons of coal.

1288. *Whitefish Point, Michigan.*—This 10-inch steam whistle was in operation some 469 hours, and consumed about 29 tons of coal.

1295. *Marquette, Mich.*—This 10-inch steam whistle was in operation some 415 hours, and consumed about 25 tons of coal.

1299. *Huron Island, Michigan.*—This 10-inch steam whistle was in operation some 252 hours, and consumed about 14 tons of coal.

1300. *Stannard Rock, Michigan.*—This 10-inch steam whistle was in operation some 156 hours, and consumed about 10 tons of coal.

1310. *Manitou, Mich.*—This 10-inch steam whistle was in operation some 658 hours, and consumed about 38 tons of coal.

1321. *Fourteen-Mile Point, Michigan.*—This 10-inch steam whistle was in operation some 27 hours, and consumed about 1 ton of coal. It was established on October 15, 1894.

1324. *Outer Island, Wisconsin.*—This 10-inch steam whistle was in operation some 478 hours, and consumed about 26 tons of coal.

1326. *La Pointe, Wis.*—This 10-inch steam whistle was in operation some 695 hours, and consumed about 39 tons of coal.

1329. *Devils Island, Wisconsin.*—This 10-inch steam whistle was in operation some 657 hours, and consumed about 27 tons of coal.

1331. *Superior Pierhead, Wisconsin.*—This 6-inch steam whistle was in operation some 895 hours, and consumed about 44 tons of coal.

1350. *Duluth (front range), Minn.*—This 10-inch steam whistle was in operation some 1,048 hours, and consumed about 45 tons of coal.

**Eleventh District.**

1352. *Two Harbors, Minn.*—This 10-inch steam whistle was in operation some 964 hours, and consumed about 50 tons of coal.

1355. *Passage Island, Michigan.*—This 10-inch steam whistle was in operation some 755 hours, and consumed about 35 tons of coal.

**BUOYAGE.**

The buoyage of Lake Huron and the St. Clair and Detroit rivers was cared for by the steam tender *Marigold* and is in good condition. One can buoy in Presque Isle Harbor, Michigan, was removed; the buoys in Lake Huron were taken up in November, markers being substituted, and were replaced in April. The buoys in St. Clair and Detroit rivers were allowed to remain in position as late as possible, not being taken up until December 10, 1894. The buoyage for the remainder of the district is attended to by contract. In St. Marys River one new spar buoy was placed on Vidal Shoal, 45 spar and 3 can buoys were placed in Hay Lake Channel, and 66 spar buoys in Superior and St. Louis bays. Sixty spar buoys and one can buoy were taken over from the War Department in Portage Lake and River.

**DEPOT.**

*Detroit, Mich.*—The wharf was covered with a layer of 2-inch planking, and the sidewalk in front of the depot site was renewed. A fence was rebuilt around the keeper's dwelling, and the house itself was repaired.

**TENDERS.**

*The Marigold.*—This iron screw steamer was placed in dry dock in April, 1894, for the examination of her stern bearings. These were found to be in good condition, but the rudder needed some repairs, which were made; her bottom was cleaned and painted, and she is now in good condition. She was almost constantly employed during the season of navigation on inspection and supply trips, coaling fog-signal stations, and in caring for buoys. In doing this she steamed 11,217 miles and consumed 586 tons of coal.

*The Warrington.*—The defective parts of the galley range of this steam screw barge were renewed, a new stovepipe was provided, her hull was calked and painted, and irons were placed upon her bow. The inside woodwork was painted, the boilers and machinery were overhauled and repaired and put in good working condition. She was loaded at the Detroit light-house depot with materials for the construction of Hay Lake Channel light-stations and for repairs at Whitefish Point light-station. She left with the construction party for Hay Lake Channel May 5, and was continuously employed on that construction to June 30. During that time she steamed some 1,709 miles, and in so doing consumed about 160 tons of coal.

**Eleventh District.**

*The Amaranth.*—This steel screw steamer was employed in delivering materials for the construction or repair of various light-stations, except while under repair or in winter quarters. Thorough repairs were made to her, consisting of a new bulkhead, making water-tight compartments, repainting the entire bottom of her hull, and overhauling the steam radiator pipes. The engineer and assistant overhauled the machinery and steam pipes, and the crew painted the galley, pantry, officer's ward-room, cook's stateroom, staterooms and main deck, companion way, after cabin, texas, life preservers, and messroom stools, and varnished the companion and accommodation ladders. The tender was taken out of winter quarters and put into commission May 1, 1895. During the year she delivered 8,048,000 pounds of material, steamed 6,839 miles, and in so doing consumed some 572 tons of coal; while in winter quarters she consumed 120 tons of coal.

*Launch of Amaranth.*—A worn-out injector of the boiler was replaced and a new propeller wheel was provided.

*Scow lighter.*—One of the scows used for general service in the district was repaired. The lower planks on each side and bottom were entirely renewed.

*Steam launch Lotus.*—This steam launch was employed from May 1 to June 30, 1895, in connection with the construction of Hay Lake Channel light-stations. She was used in transporting materials and in conveying workmen from station to station.

## TWELFTH DISTRICT.

This district extends from the boundary between California and Mexico to the boundary between California and Oregon. It embraces all aids to navigation on the seacoast, bays, rivers, and other tidal waters of California.

*Inspector.*—Commander Henry E. Nichols, United States Navy.

*Engineer.*—Maj. William H. Heuer, Corps of Engineers, United States Army.

There are in this district—

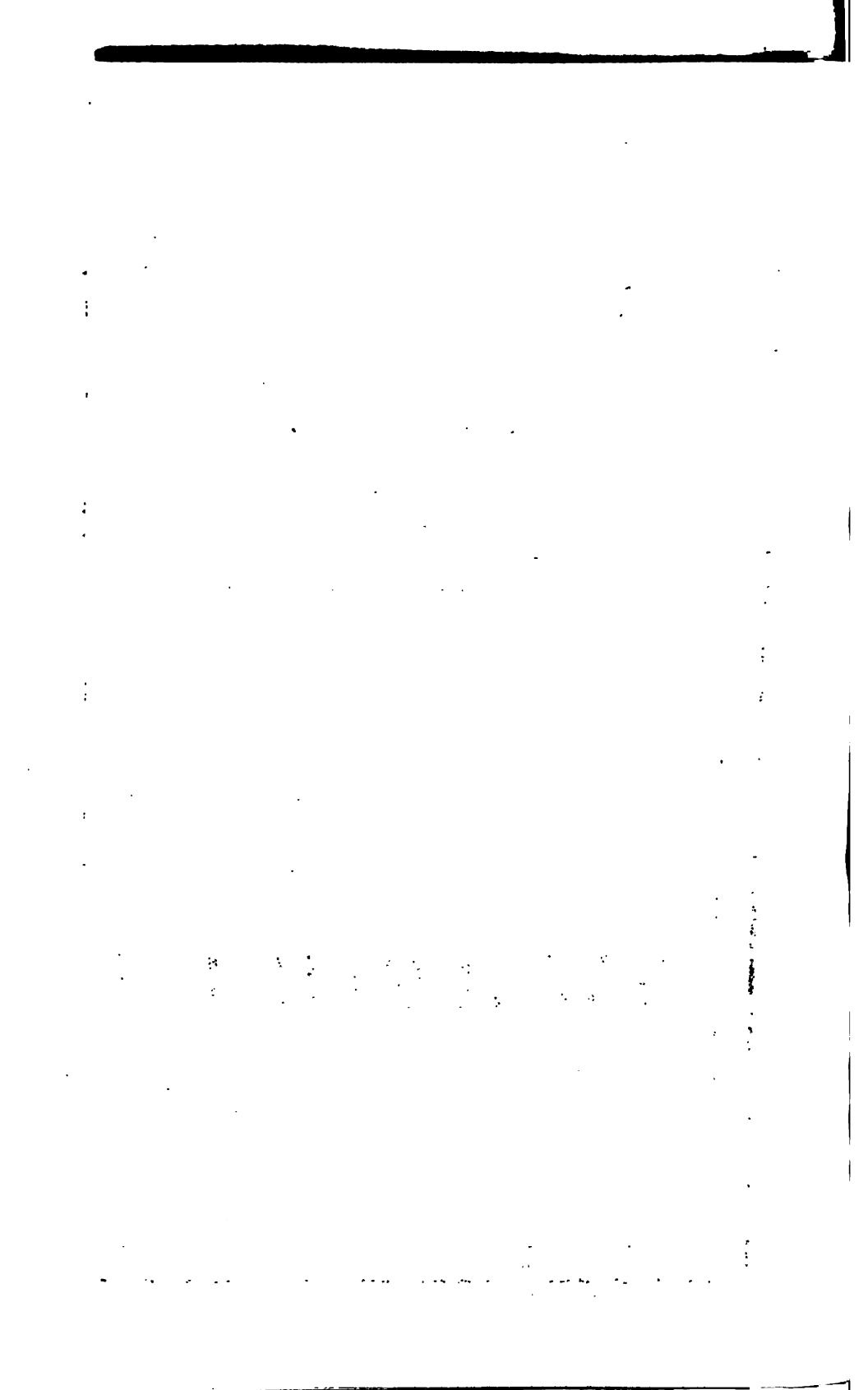
Light-houses and lighted beacons, including 5 post lights.....	39
Day or unlighted beacons.....	49
Lighted beacons used also as day marks.....	7
Fog signals operated by steam.....	15
Fog signals operated by clockwork.....	7
Fog signals operated by hand.....	1
Whistling buoys in position.....	12
Bell buoys in position.....	6
Other buoys in position.....	73
Steamer <i>Madroño</i> , buoy tender, and for supply and inspection.....	1
Steam launch of <i>Madroño</i> .....	1
Steam launch <i>Hazel</i> .....	1

## LIGHT-HOUSES.

889. *Point Conception, entrance to Santa Barbara Channel, California.*—The water supply has been a source of trouble for some time. It came partly from a spring and partly from rain caught on the roofs of the light-house structures. The supply from the spring was forced by a hydraulic ram to the cisterns on the hill where the dwellings stand, and from there a pipe took the surplus to the cistern at the signal. In this way the full supply of the spring could not be utilized at the signal, where it was most necessary. To remedy this a plan was adopted to lead the water, through a pipe running along the face of the cliffs, from the spring to the cistern at the signal, the fall being sufficient to allow the water to flow into the latter by gravity. Near the cistern a hydraulic ram is to be placed to force up the hill what water is required for the dwelling. By this plan the entire capacity of the spring is available for the signal, and only what is absolutely needed for household purposes need be diverted. At the end of the fiscal year this project was being carried out. Minor repairs were made.



14



**Twelfth District.**

— *Point Arguello, about 12 miles northwest of Point Conception, seacoast of California.*—The following recommendation, which appeared in the Board's annual report for the last six years, is renewed:

This point is about 12 nautical miles to the northward and westward of Point Conception. It is reported to be one of the foggiest places on the Pacific coast. In consequence of the sharp bend in the coast, the outlying rocks, and the almost constant fog that prevails, Point Arguello is one of the most important points on the coast at which a light and fog-signal station should be established. The United States already owns the site which is deemed most suitable for the buildings. It is therefore estimated that the work can be done at a cost not to exceed \$35,000, and it is recommended that an appropriation of this amount be made therefor.

890. *San Luis Obispo, seacoast of California.*—The landing wharf and bridge approach thereto were severely damaged by the winter storms, and were in a dangerous condition. This wharf was built from a rock in the bay separated from the mainland by a narrow channel. A new wharf was built, supported on piles with chisel-pointed dowels projecting from their lower ends and fitted with iron rings. The piles were lowered into place on the rock bottom and then revolved until the iron rings rested solidly on the rock. The inside supports were also fitted with dowels, seats for which were hollowed out of the rock; the feet of the posts were afterwards filled around with concrete. The boat-steps were extended 8 feet to allow landing at low tide. The bridge of the approach was removed and a new structure was erected. The channel was spanned by a truss bridge 45 feet long. The entire structure was decked, and a suitable hand rail was put up.

892. *Point Sur, seacoast of California.*—The new road from the station over the Sur ranch to the county road, in progress of construction at the close of the last fiscal year, was completed. Various minor repairs were made to the signal apparatus and to the upright boiler. Some 700 feet of water pipe were put in to extend the service to the barn.

893. *Point Pinos, entrance to Monterey Bay, California.*—The following recommendation, which was made in the Board's annual report for the last six years, is renewed:

The plot of land owned by the Government at this station does not touch the sea at any point on its boundary line. For convenience in landing stores and supplies it is essential that the United States should own the strip of land between the light-house lot and the seacoast. The owners have offered to sell the land desired for \$2,000, and the Board recommends that an appropriation be made for its purchase.

Various repairs were made.

896. *Pigeon Point, extreme end of Pigeon Point, Pacific Ocean, California.*—The following recommendation made in the Board's last annual report is renewed:

There are standing outside of the light-house site, but close to the fence inclosing the light-house structures, a fisherman's shanty and a hay barn. If a fire should break out in either of these buildings it would endanger the structures of the light-station. It is proposed, in order to obviate this danger, that an additional strip of

**Twelfth District.**

land to the eastward of the station, say 150 feet wide, be purchased and added to the light-house reservation. This, it is estimated, can be done for not exceeding \$5,000, and it is recommended that an appropriation of this amount be made therefor.

898. *Farallon, on southeast Farallon Islet, off the entrance to San Francisco Bay, Pacific Ocean, California.*—The pumps supplying the fog-signal boilers with water broke down, thus disabling the signal. A new No. 2 Hooker pump was purchased, taken to the station by the light-house tender, and erected on the day the damage was reported, thus restoring the efficiency of the station.

900. *Fort Point, San Francisco Bay, California.*—On account of the breaking of the flume, which is not under the control of the Light-House Establishment, from which this station was furnished with water, the supply was cut off. It was necessary, therefore, to purchase a 25,000-gallon tank, which was erected near the dwellings, and filled with water from the army reservoir. As it was doubtful if sufficient water from this source could be spared to meet the requirements of the station, it was decided to construct a cement rain catchment on the hill just above the cistern. This work was in progress at the end of the year.

— *Quarry Point, Angel Island, San Francisco Bay, California.*—The following recommendation made in the Board's last three annual reports is renewed:

Various petitions were received from those representing marine interests asking that a fog signal be established at this point. The passage between the eastern side of Angel Island and Southampton Shoal is quite narrow. The strong tides setting in and out through the Golden Gate have full force on a vessel bound up or down the bay, and in the case of ships being towed, as so many are past this point, the set of the current is enough to make it hazardous, there being danger either of running aground on Southampton Shoal or Angel Island. An enormous quantity of shipping annually passes this point, bound to and from the great grain wharves at Port Costa, the Sacramento and San Joaquin rivers, and Mare Island Strait. Hundreds of the largest sailing ships are towed from San Francisco to Port Costa, where they load with grain and are then towed down and out to sea. In this way there is more shipping passing through these waters than anywhere else in the district, except through the Golden Gate. There have been a number of casualties in the vicinity of this point.

Among many were the following:

The ferry steamer *Contra Costa*, plying between San Francisco and San Quentin with passengers, ran ashore near California City.

The ship *E. B. Sutton*, while being towed down from Port Costa, ran ashore near Quarry Point, Angel Island.

The ship *Eleanor Margaret*, bound to Port Costa, ran ashore on Bluff Point, Raccoon Straits.

The ship *Maulsden*, while being towed to Port Costa, ran ashore on Southampton Shoal.

Mariners have asked that Quarry Point be selected for the fog-signal station, because, to make a start up river in a fog, it is necessary to make Angel Island to get a departure. After careful examination the Board reached the conclusion that a fog signal at this locality would be a decided aid to mariners. In view of the great economy of establishing and maintaining a large fog bell here instead of a steam fog

**Twelfth District.**

signal, it decided in favor of the former. It is estimated that it will cost \$6,000 to establish this fog bell, and it is recommended that an appropriation of this amount be made therefor.

915. *Point Reyes, on the western extremity of Point Reyes, Pacific Ocean, California.*—The lower coal chute was rebuilt for 250 feet, and 80 feet of the planking on the upper part were renewed. A new hand rail was put up alongside the steps, and slight repairs were made to the latter. Various repairs were made.

917. *Cape Mendocino, on the western extremity of Cape Mendocino, California.*—A topographical survey of the station was made. The keeper's double dwelling, built twenty-three years ago, was in a dilapidated condition. Contract was made for the repair of the building, which was to be torn down to the foundation and rebuilt to a story and a half, using such old timber as was suitable. Work was begun in May, and by the end of the fiscal year the contractors had torn down the old frame, repaired the foundation wall, and had the new frame up. The work is still in progress. As the dwelling, when rebuilt, will be smaller than the old two-story structure and will not accommodate all the keepers and their families, another one story cottage will be required. The plans therefor were made, but no funds are available for its construction. It is recommended, therefore, that an appropriation of \$5,500 be made for the construction of the new cottage.

921. *St. George Reef, on Northwest Seal Rock, off Crescent City, sea-coast of California.*—On account of the scarcity of water it was determined to change the characteristic of the fog signal to longer silent intervals—to lessen the expenditure of steam. This was done on March 1, 1895. The characteristic is now blasts of 5 seconds with silent intervals of 75 seconds. Various repairs were made.

**REPAIRS.**

During the fiscal year repairs and renovations more or less extensive were made at the following-named stations:

880. Point Loma, Cal.	903. Alcatraz Island, Cal.
881. Ballast Point, Cal.	904. Yerba Buena, Cal.
888. Santa Barbara, Cal.	905. Oakland Harbor, Cal.
891. Piedras Blancas, Cal.	909. East Brother Island, Cal.
894. Santa Cruz, Cal.	910. Mare Island, Cal.
895. Año Nuevo Island, Cal.	911. Roe Island, Cal.
897. Point Montara, Cal.	916. Point Arena, Cal.
899. Bonita Point, Cal.	918. Humboldt, Cal.
901. Lime Point, Cal.	919. Trinidad Head, Cal.
902. Angel Island, Cal.	920. Crescent City, Cal.

**DAY OR UNLIGHTED BEACONS.**

*San Mateo beacon, off Point San Mateo, San Francisco Bay, California.*—This beacon was carried away and was replaced with a new three-pile structure, surmounted with crossed boards, painted red.

**Twelfth District.**

*Anita Rock, San Francisco Bay, California.*—The iron spindle surmounted with an iron cage, which formerly marked this rock, was broken off by being run into by a schooner. An examination was made and the broken spindle was found lying near the rock.

**LIGHTED BEACONS USED ALSO AS DAY MARKS.**

*Beacon No. 2, San Diego Bay, California* (lens lantern, fixed red).—A three-pile beacon crowned by a box and lens lantern, painted red and marked with the figure 2 in white.

*La Playa beacon, San Diego Bay, California* (lens lantern, fixed white).—On the mainland close to the inner end of Quarantine Station Wharf, a tripod, whitewashed.

*Beacon No. 6, San Diego Bay, California* (tubular lantern, fixed red).—A three-pile beacon crowned by a box and tubular lantern, painted red and marked with the figure 6 in white.

*Diamond beacon, San Diego Bay, California* (tubular lantern, fixed red).—A single-pile beacon crowned by a diamond and surmounted by a tubular lantern, painted red.

*South San Francisco beacon (front), San Bruno Channel, California.*—A five-day fixed-red tubular lantern, supported on a four-pile beacon, whitewashed, surmounted by a platform, and red lantern box suspended from an iron crane.

**FOG SIGNALS OPERATED BY STEAM.**

889. *Point Conception, California.*—The 12-inch steam whistles, in duplicate, were in operation some 518 hours, and consumed about 41 tons of coal.

890. *San Luis Obispo, Cal.*—The 10-inch steam whistles, in duplicate, were in operation some 1,785 hours, and consumed about 96 tons of coal.

892. *Point Sur, California.*—The 12-inch steam whistles, in duplicate, were in operation some 1,466 hours, and consumed about 126 cords of wood.

895. *Año Nuevo Island, California.*—The 12-inch steam whistles, in duplicate, were in operation some 783 hours, and consumed about 45 tons of coal.

896. *Pigeon Point, California.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 867 hours, and consumed about 78 cords of wood.

897. *Point Montara, California.*—The 12-inch steam whistles, in duplicate, were in operation some 790 hours, and consumed about 91 cords of wood.

898. *Farallon, California.*—The first-class steam siren, in duplicate, was in operation some 1,421 hours, and consumed about 85 tons of coal.

**Twelfth District.**

899. *Bonita Point, California.*—The first-class steam siren, in duplicate, was in operation some 1,632 hours, and consumed about 118 tons of coal.

901. *Lime Point, California.*—The 12-inch steam whistles, in duplicate, were in operation some 1,027 hours, and consumed about 100 tons of coal.

904. *Yerba Buena, California.*—The 10-inch steam whistles, in duplicate, were in operation some 89 hours, and consumed about 9 tons of coal.

909. *East Brother Island, California.*—The 12-inch steam whistle was in operation some 145 hours, and consumed about 11 tons of coal.

915. *Point Reyes, California.*—The 12-inch steam whistles, in duplicate, were in operation some 1,573 hours, and consumed about 116 tons of coal.

916. *Point Arena, California.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 1,452 hours, and consumed about 126 cords of wood.

918. *Humboldt, Cal.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 1,029 hours, and consumed about 111 cords of wood.

921. *St. George Reef, California.*—The 12-inch steam whistles, in duplicate, were in operation some 452 hours, and consumed about 35 tons of coal.

**BUOYAGE.**

The buoyage of the district is in excellent condition. The following-named new buoys were established during the past year, on the dates named:

July 17, 1894, San Antonio spar buoy, San Francisco Bay.

February 13, 1895, Anita Rock buoy, San Francisco Bay.

May 11, 1895, Crescent City, Cal., bell buoy.

The following-named buoys were discontinued on the dates named, being of no further use to navigation:

September 4, 1894, Humboldt Bar, California, south jetty reef buoy.

October 15, 1894, Humboldt Bay, California, buoy No. 1.

October 15, 1894, Humboldt Bay outer junction buoy (Bucksport channel).

February 28, 1895, San Pablo Bay, Cal., buoy No. 4.

March 1, 1895, Humboldt Bar, California, mid-channel.

May 11, 1895, Crescent City, Cal., black spar buoy.

June 26, 1895, Carmel Cove, California, spar buoy.

June 29, 1895, Humboldt Bay, California, south jetty spit buoy.

June 29, 1895, Humboldt Bar, California, black spar buoy.

The bell buoy placed in the inner harbor of Crescent City, Cal., on April 24, 1894, was destroyed during the heavy southeast gales of the past winter. A different location was selected and another buoy was placed there.

**Twelfth District.****DEPOT.**

*Yerba Buena Island, California.*—A small building, formerly used to cover the hoisting engine, was moved to a position near the pump house, to be used for the storage of fuel.

With the exception of the blacksmith shop, the depot buildings are in a fair condition. The wharf is in poor condition and will soon be unsafe for moving and storing heavy buoy appendages. Every year makes this improvement more imperative. It is only by good fortune that the wharf has not collapsed and fallen into the bay. The blacksmith shop is in a very bad condition. A blacksmith has been employed in connection with the tender since July 1, 1893. It has not been necessary since then to employ outside labor for repairing buoys and their appendages nor on any other repairs requiring working in iron or steel. A large room has been partitioned off from the north end of the main storehouse and fitted up with benches, lathes, etc., for a general workshop.

The following recommendation, made in the Board's last annual report, is renewed:

The wharf is in a bad condition; many of the piles are nearly eaten through by the teredo and limnoria. In case of a violent storm the entire structure is in danger of being carried away and its valuable freight of buoys, chains, sinkers, etc., lost. The importance of obtaining funds to avert this impending disaster can not be too strongly urged. It is estimated that it will cost \$30,000 to put this wharf and its appurtenances in good condition, using concrete piers and steel I beams. It is recommended that an appropriation of this amount be made for the purpose.

The structures at this light-house depot have lately been again menaced by fire, which, starting on the north side, was carried by the wind and burned the grass and shrubbery over the entire island, being stopped just outside the light-house reservation by starting back fires. The water supply proved utterly inadequate to the emergency.

The following recommendation, made in the Board's last annual report, is therefore renewed:

A pumping plant and a plant for increasing the water storage capacity, with the object of supplementing the present water supply, is needed, as that now in use is inadequate to the needs of the station, and in case of fire would be of little use. The estimated cost of this improvement is \$5,100. It is recommended that an appropriation of this amount be made for this purpose.

**TENDER.**

*The Madroño.*—This iron screw steamer was actively employed during the year in attending to the buoyage, supply, and inspection of the district. She changed or replaced 104 buoys, painted or repaired 27 beacons, landed some 900 tons of coal at 23 stations, and delivered supplies at 35 stations. The vessel was laid up 96 days for necessary repairs to hull and machinery. Her rigging, boats, etc., are in fairly



**Twelfth District.**

good condition. She conveyed the inspector, who made 143 inspections during the year, to all stations except Cape Mendocino and Humboldt, which are visited by other means of conveyance. In doing this the *Madroño* steamed 6,970 miles upon a consumption of 678 tons of bituminous coal. The crew were employed at the depot some 1,332 hours.

*Steam launch Hazel.*—This launch was taken out on the ways in April. Slight repairs were made to her stern bearings, and her planking was renewed in a few places where defective. She was scraped, cleaned, and painted, and is now in good order.

## THIRTEENTH DISTRICT.

This district extends from the boundary between California and Oregon to the northern boundary of the United States and includes Alaska. It embraces all aids to navigation on the seacoast of Oregon and Washington, on the United States waters of the Strait of Juan de Fuca, Washington Sound, and the Gulf of Georgia, and on the tidal waters tributary to the sea, strait, sound, and gulf between the limits named, together with those on Alaskan waters.

*Inspector.*—Commander Oscar W. Farenholt, United States Navy.

*Engineer.*—Maj. James C. Post, Corps of Engineers, United States Army.

There are in this district—

Light-houses and beacon lights, including 99 post lights .....	114
Light-ship in position .....	1
Day or unlighted beacons .....	42
Fog signals operated by steam or hot-air engines .....	10
Fog signals operated by clockwork .....	3
Whistling buoys in position .....	8
Bell buoys in position .....	4
Other buoys in position .....	271
Steamer <i>Manzanita</i> , buoy tender, and for supply and inspection .....	1
Steamer <i>Columbine</i> , buoy tender, and for supply and inspection .....	1

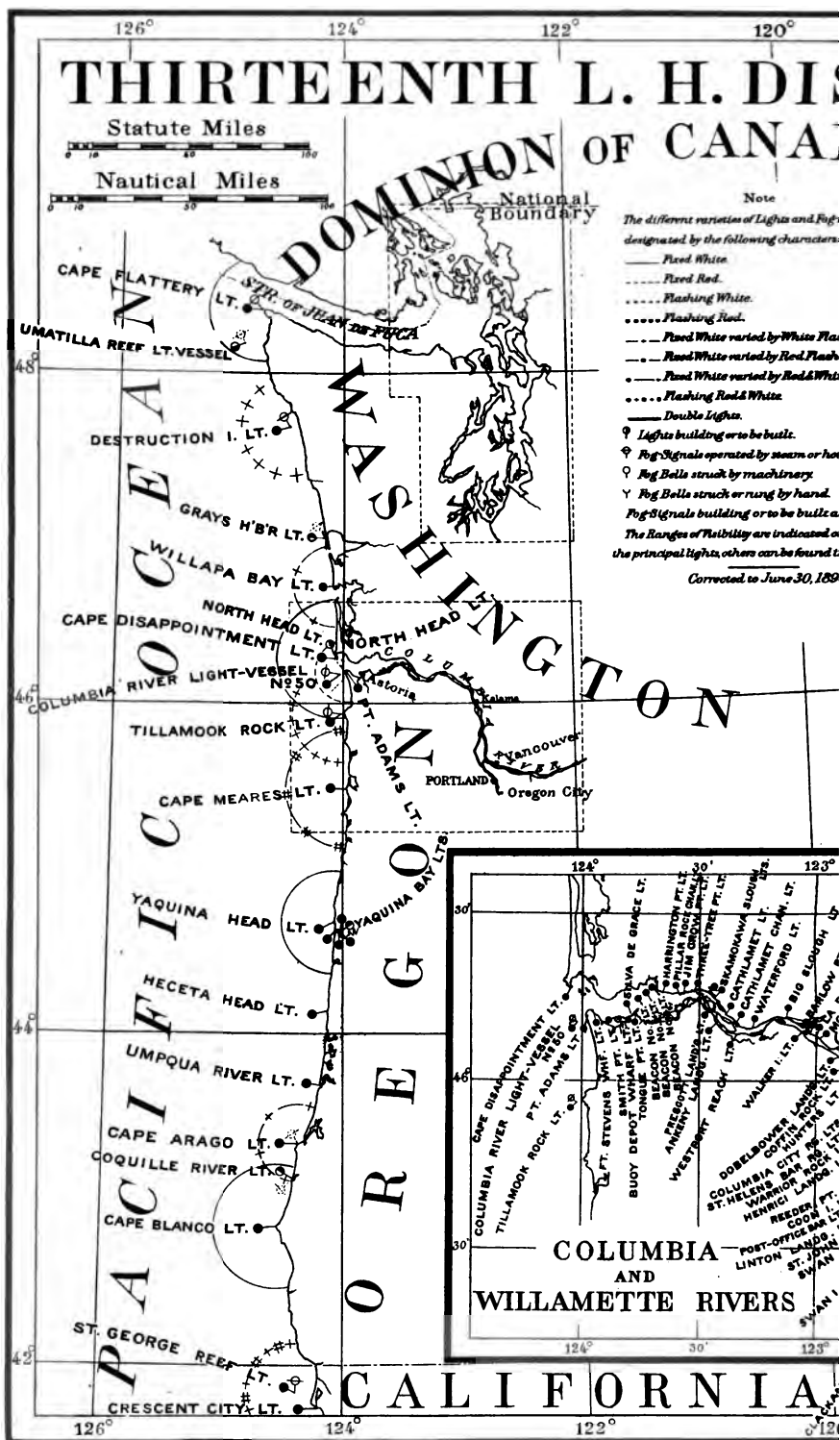
## LIGHT-STATIONS.

922. *Cape Blanco, seacoast of Oregon.*—A new cistern was built for an increased water supply. The wood shed was moved back and put upon new foundations. A washhouse was built and a wagon shed was added to the barn. Extensive repairs were made.

923. *Coquille River, seacoast of Oregon.*—Drawings and specifications for the tower and fog-signal building, the dwellings, barn, cisterns, etc., were prepared and contract was made. In April, 1895, the contractors shipped men, tools, and materials to the station, and since then have been getting out stone for the work. The rock upon which the tower and fog signal will be built was prepared to receive the foundation of the building.

924. *Cape Arago, on a small island at the western end of Cape Arago, seacoast of Oregon.*—By the act approved August 18, 1894, \$15,500 was made available for this work. Plans and specifications were made for a new tower, fog-signal buildings, double dwelling, cistern, tramway,





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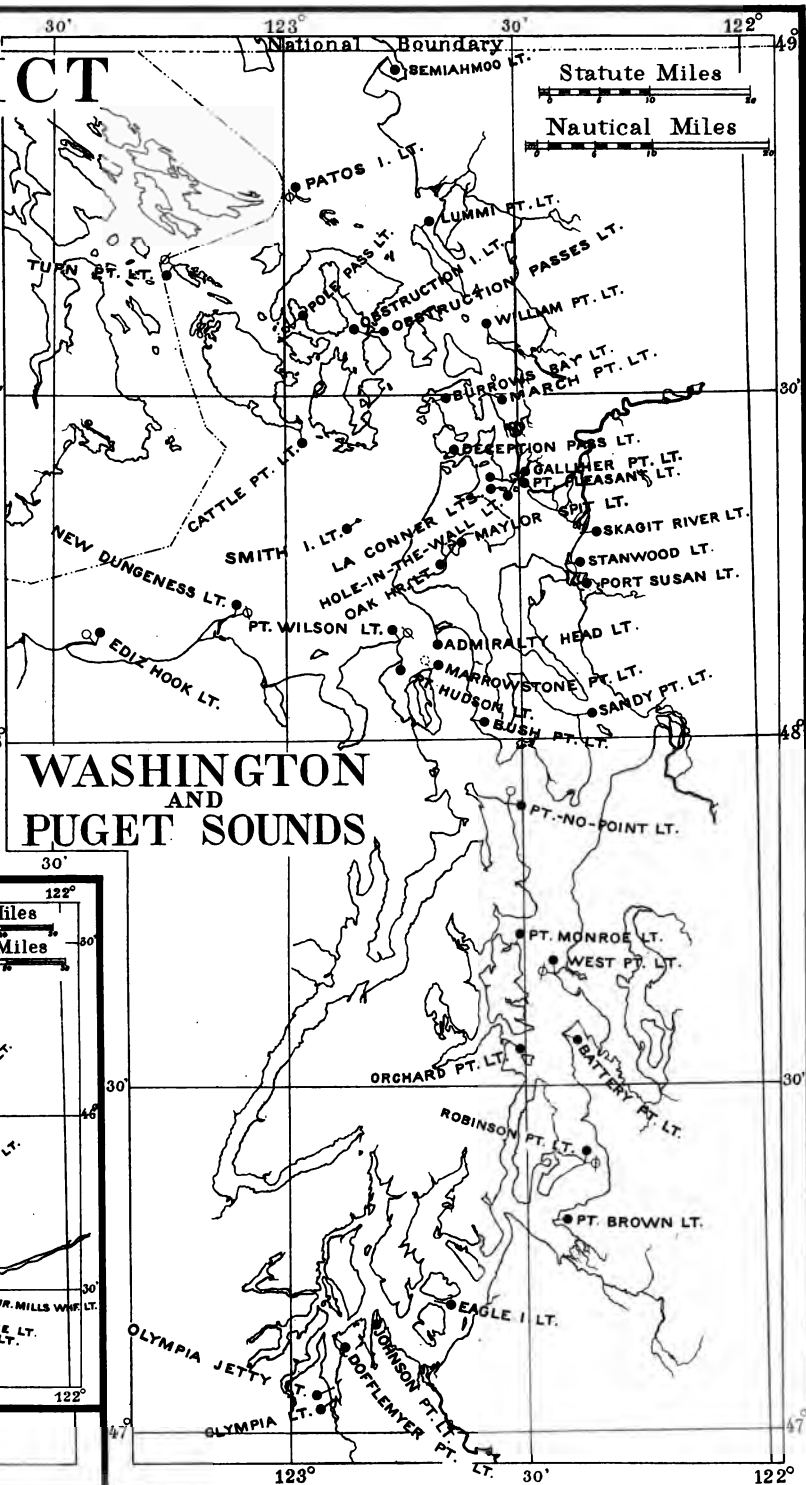
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**Thirteenth District.**

fences, etc. The station is not at present in a habitable condition, and no repairs were made during the year, awaiting the erection of a new dwelling. The wagon road leading to South Slough, a distance of 3 miles, over which all supplies used at the station must be carried, is in very bad condition and almost impassable. A boathouse on South Slough, at the terminus of the road, is also urgently needed. Plans and specifications were prepared, but as there appears to be some question as to the title of the Government to the road the work is suspended for the present.

925. *Umpqua River, seacoast of Oregon.*—Two oil houses of galvanized iron were erected. A fence is being built around the cleared grounds of the station. Furnaces for heating the dwellings are now being put in. Various repairs were made.

926. *Heceta Head, mouth of Siuslaw River, between Cape Arago and Cape Foulweather, seacoast of Oregon.*—A large land slide, which endangered the tower and oil house, was removed, and a longer slope was given to the bank behind them to prevent further sliding. The point of rocks near the tower, in line with the light and Cape Perpetua, was cut down and sloped back, so as to give an unobstructed view of the light. Foot walks from the tower to the dwellings, and also around the dwellings, etc., were laid. A picket fence was built around the dwellings, and poles for electric call-bell wires were set up and wires strung. The right to use the water and lay a pipe, etc., from a spring outside the reservation was purchased, and a fence was placed around the spring, a water tank was made, and pipes are being laid connecting it with the buildings and tower, to supply water to the station for fire protection and irrigation. Various repairs were made.

— *Yaquina Bay, Oregon.*—The following-named beacon lights were established here on March 7, 1895, and were paid for from the general appropriation for repairs, etc., of light-houses, which provides for the establishment, under certain specified circumstances, of such beacon lights:

*Yaquina Bar range front beacon light.*—A fixed white lens-lantern light, 12½ feet above mean high water, on a shelf on a white two-pile dolphin on the sand flat, dry at low water, making off to the northward from the south point of the entrance to the bay. This light was discontinued on July 29, 1895, as a rock was discovered on the range line about three-eighths of a mile outside the jetties. The rock was marked by a first-class red spar buoy.

*Yaquina Bar range rear beacon light.*—A fixed white tubular-lantern light, 20½ feet above mean high water, on a white gallows frame, at McLeans Point, nearly three-fourths nautical mile NE. ½ E. in the rear of the preceding, in range with which it marks the line of best water for crossing the bar and entering between the heads of the jetties. This light will be moved as the channel changes. On June 18, 1895,

**Thirteenth District.**

the height of this light was increased to 30½ feet above mean high water.

*Government Wharf beacon light.*—A fixed red tubular-lantern light, 12½ feet above mean high water, on a white shelf on the south end of the Government Wharf at Newport.

*Middle Ground beacon light.*—A fixed white tubular-lantern light, 12½ feet above mean high water, on a shelf on a single white pile on the north edge of the Middle Ground, a sand flat dry at low water, and the south edge of the channel at a sharp turn.

*Coquille Point beacon light.*—On July 1, 1895, a fixed white tubular-lantern light was established about 30 feet above mean high water, on a white stake 19 feet high, located about 20 feet back from the outer end of the cribwork bulkhead at Coquille Point, east side of the entrance from Yaquina Bay into Yaquina River, to guide in the narrow channel to Yaquina City.

928. *Cape Meares, south of Tillamook Bay, seacoast of Oregon.*—A work room attached to the tower, built of brick, was partly finished; a flight of iron steps, to lead from the level of the tower to the top of the bank, and a wood shed were begun, but it was impossible, on account of bad roads, to deliver all the materials at this station in time to complete the structure within the fiscal year. Everything is now delivered, and the work will be completed as soon as practicable.

929. *Tillamook Rock light and fog-signal station, 18 miles south of the entrance to the Columbia River, seacoast of Oregon.*—A severe storm occurred December 9, 1894, accompanied by a very high sea that broke over the whole station, destroying 13 lights of glass in the lantern and damaging the lens and revolving apparatus. The seas broke in the roof of the dwelling and flooded the entire premises. It also dislodged the loose fragments from the face of the rocks and hurled them upon the roof of the dwelling and fog-signal station, crushing it in many places. On December 18, when the storm had subsided sufficiently, a landing was effected and temporary repairs were made. Plans and estimates for a new and much stronger roof for the dwelling and fog-signal building are being prepared.

— *Tillamook Rock telegraph line.*—No attempt has been made to lay the cable. The cable is now in a tank under water at the buoy depot to be tested. An inspection of the line from Fort Stevens to the beach opposite Tillamook Rock will soon be made to ascertain its condition and the probable cost of putting it into repair. If the funds are sufficient to put the land line in good order, and the cable is still in a serviceable condition, an attempt will be made to establish communication between the station and the shore.

— *Fort Stevens light and fog signal, mouth of the Columbia River, Oregon.*—Since the commencement of the jetty at the mouth of the Columbia River, and up to the present time, it has been the practice to



**Thirteenth District.**

blow the steam whistles of the hoisting engines on Fort Stevens wharf during fogs in response to any steamer sounding its whistle and trying to find its way along the channels, and this has been a great assistance to navigation. When the jetty is completed and the hoisting engines have been removed, which will be done by, say, October 1, 1895, a fog signal located near this wharf will be a necessity to navigation. A suitable harbor light is also needed at this point. When the Point Adams light is discontinued, the lens, together with the other property at that station, can be used in the establishment of a light-station at Fort Stevens. It is estimated that the cost of establishing this new station, including all buildings, machinery, etc., needed, will be about \$11,000, and it is recommended that an appropriation of this amount be made therefor.

— *Willamette River light-station, at the mouth of the Willamette River, Oregon.*—Contract was made for the erection of the station. It is expected that the work will be begun at an early day.

985. *North Head, Cape Disappointment, entrance to Columbia River, Washington.*—By the act approved August 18, 1894, an appropriation of \$25,000 was made toward establishing a seacoast light here and authority was given to contract therefor at a cost not to exceed \$50,000. By the act approved March 2, 1895, an additional \$25,000 was appropriated. A survey was made for the wagon road to the site of the proposed station and a trail was cut through the dense growth of timber and brush along the line of survey. Specifications and plans for the road were made. Drawings for the tower, dwellings, etc., are in progress and will be completed at an early date.

987. *Grays Harbor, seacoast of Washington.*—By the act approved March 2, 1895, an appropriation of \$39,500 was made for completing this light and fog signal. The purchase of the site was delayed by the difficulties in obtaining title. Thereupon an appeal was made to the State legislature. In response it passed an act "making owners or claimants parties to proceedings for the appropriation of property to public use," which did not go into effect until June 14, 1895. The matter has been placed in the hands of the proper United States attorney, who is to obtain the site by condemnation.

988. *Destruction Island light and fog-signal station, seacoast of Washington.*—To aid the ventilation and drying of the interior of the tower a small workroom was built adjoining it. The work was completed in July, and the keeper reports the condition of the inside of the tower greatly improved. Various repairs were made.

There are accommodations here for two married and one single keeper; but as four keepers are stationed here, and as usually three of them have their families with them, the buildings are insufficient to house them properly. Another keeper's dwelling is needed. It is estimated that it would cost, say, \$5,000, and it is recommended that an appropriation of this amount be made therefor.

**Thirteenth District.**

989. *Cape Flattery light and fog-signal station on Tatoosh Island, entrance to the Strait of Juan de Fuca, Washington.*—This station is in good order with the exception of a fog-signal building, improvements and repairs to which have been postponed from year to year with the expectation that the sum asked for to establish this signal on Middle Island would be appropriated, when new buildings could be erected. The fog-signal buildings are in very poor condition and are unfit for the proper care and economical working of the boilers and apparatus, and if the removal of the fog signal is postponed extensive repairs and alterations will be necessary at an early date. Various repairs were made.

990. *Ediz Hook light and fog-signal station, Strait of Juan de Fuca, Washington.*—No repairs were made at this station during the year. The Port Angeles Mill and Lumber Company, who have been for several years illegally occupying part of the reservation of the station, were ejected from the premises.

991. *New Dungeness light and fog-signal station, Strait of Juan de Fuca, Washington.*—The machinery of the fog signal was thoroughly overhauled and repaired and is now in good order. Various repairs were made.

The dwellings erected at this station are arranged for the accommodation of two families and one single man; but as there are four keepers employed, and sometimes three of them with families, there is insufficient accommodation and a new dwelling is urgently needed. The estimated cost of a suitable building, cistern, outhouse, etc., for this station is \$4,000.

992. *Smith Island, Puget Sound, entrance to Admiralty Inlet, Washington.*—The new lens and revolving apparatus were placed in position and are in good working order.

993. *Point Wilson light and fog-signal station, Admiralty Inlet, Washington.*—The new boiler for the fog signal was set up and a new engine room was built. The old boiler was removed and the operating apparatus was repaired and attached to the new boiler. Trials were made and everything appeared to be in excellent order. Various repairs were made.

996. *Marrowstone Point post light, Admiralty Inlet, Washington.*—The land needed for this station was set apart. The plans and specifications for the light-house structures are about completed.

998. *Point No Point light and fog-signal station, Puget Sound, Washington.*—The following recommendation, made in the Board's last annual report, is renewed:

It appears that the present fog bell at Point No Point does not satisfy the needs of the service. It is recommended, therefore, that a first-class fog signal be installed in place of the bell. It is estimated that this can be done for \$6,000, and the Board recommends that an appropriation of this amount be made therefor.

**Thirteenth District.**

1000. *West Point light and fog-signal station, Puget Sound, Washington.*—Under the contract 125 cubic yards of stone were delivered along the bulkhead on the north side of the station to prevent high seas from cutting the bank away. The dike on the east line of the station was rebuilt; also 400 feet of the embankment along the north side. Various repairs were made.

1001. *Battery Point post light, Puget Sound, Washington.*—The establishment of a fog signal at this point is strongly urged. It is estimated that a fog bell with suitable dwelling, grounds, etc., could be erected for \$6,000, and it is recommended that an appropriation of this amount be made therefor.

1003. *Robinson Point post light and fog signal, Puget Sound, Washington.*—A survey of the station was completed in December, 1894. Contract was made for the delivery of 350 cubic yards of stone along the north and east bulkheads to protect them from high seas. The filling in behind the bulkheads was begun, and at the close of the fiscal year an embankment of earth about 12 feet wide was placed behind the north bulkhead.

1004. *Point Brown post light, Puget Sound, Washington.*—In addition to the stake light at this important turning point of the numerous water crafts plying between Tacoma and points down the sound a fog signal is urgently required. It is estimated that a bell struck by machinery could be erected, together with the necessary buildings, dwellings, etc., for about \$6,000, and it is recommended that an appropriation of this amount be made therefor.

1031. *Patos Islands, entrance to Canal de Haro, Washington.*—A survey was completed in November, 1894. The engines, pump, reed box, etc., were all adjusted and tested. A new and longer trumpet was substituted for the old one, which gives better satisfaction.

— *Post lights in Puget Sound and its adjacent waters, and the Columbia and Willamette rivers, and Yaquina Bay.*—These lights are efficient aids to navigation in these inland waters. Twelve new ones were established during the year and three were discontinued. Two range lights, to cross in over the bar, and three beacon lights were erected at Yaquina Bay, Oregon. They have proved to be satisfactory aids to navigation. Several post lights were changed to more advantageous positions. With the exception of a few near La Conner, Wash., all lights were inspected, and all stakes, gallows frames, and beacons were repaired and painted. The keepers were found to have done their work in a satisfactory manner.

The following statement, made in the Board's last annual report, is repeated:

The post lights in the Columbia and Willamette rivers, in Puget Sound, and in adjacent waters are of great benefit to navigation, and night boats now run regularly on the Columbia and Willamette rivers. They are of much use during fog, as

### Thirteenth District.

the lights can be seen, except in very dense fogs, at a distance of 100 yards or more, and the pilots rely on the lights for a new departure. Without their aid night boats could not run regularly. The demand for these lights on Puget Sound and its tributary rivers is increasing with the growing commerce. The Board recommends, therefore, the establishment of thirty post lights along the navigable channels of the Snohomish River, the Skagit River, the Nooksack River, and the La Conner Slough, and along such other channels of Puget Sound and the rivers tributary thereto, in the State of Washington, as may be necessary to meet the requirements of commerce.

It is estimated that this will cost not to exceed \$4,200, and the Board recommends that they be provided for by name in the appropriation for lighting rivers.

— *Willamette River post lights, Oregon.*—The following statement, made in the Board's last two annual reports, is repeated:

The establishment of beacon lights and buoys at 25 different points between the cities of Salem and Portland, Oreg., at a cost not exceeding \$5,000, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that they be provided for by name in the appropriation for lighting rivers.

### REPAIRS.

Repairs were made at the following-named stations:

927. Yaquina Head, Oreg.	989. Cape Flattery, Wash.
968. Warrior Rock post light, Oreg.	994. Admiralty Head, Wash.
985. Cape Disappointment, Wash.	1030. Turn Point, Wash.
986. Willapa Bay, Wash.	

### LIGHT-VESSELS.

930. *Columbia River light-vessel, No. 50, off the Columbia River bar, Washington.*—The vessel, light, and fog signal are in good order. She was originally placed on her station in April, 1892. On August 22, 1894, she was taken to Astoria and thoroughly repaired. On September 5, 1894, she was replaced on her station.

— *Umatilla Reef light-vessel, Pacific Ocean, off the Strait of Juan de Fuca, Washington.*—By act of March 2, 1895, \$40,000 was appropriated, and the Board was authorized to contract for constructing, equipping, and outfitting a steam light-ship with fog signal, the total cost not to exceed \$80,000. The plans for this vessel are being made, and she will be put under contract as soon as practicable. It is recommended that \$40,000 be appropriated in addition to the \$40,000 appropriated last year, to meet the expenses to be incurred under the authorized contract.

### DAY OR UNLIGHTED BEACONS.

The day beacons were thoroughly repaired and in many instances rebuilt. Spindles were erected on Orchard Rocks, Richs Passage, Puget Sound, and on Black Rock, Rosario Strait, Washington.

**Thirteenth District.****FOG SIGNALS OPERATED BY STEAM OR HOT AIR.**

929. *Tillamook Rock, Oregon*.—The first-class siren, in duplicate, was in operation some 423 hours, and consumed about 20 tons of coal.

930. *Columbia River light-vessel No. 50, Washington*.—The 12-inch steam whistle was in operation some 774 hours, and consumed about 52 tons of coal.

988. *Destruction Island, Washington*.—The first-class steam siren, in duplicate, was in operation some 619 hours, and consumed about 35 tons of coal.

989. *Cape Flattery, Washington*.—The 12-inch steam whistle, in duplicate, was in operation some 822 hours, and consumed about 41 tons of coal and about 56 feet of wood.

991. *New Dungeness, Washington*.—The 12-inch steam whistle was in operation some 488 hours, and consumed about 35 tons of coal.

993. *Point Wilson, Washington*.—The 12-inch steam whistle was in operation some 361 hours, and consumed about 27 tons of coal.

1000. *West Point, Washington*.—The Daboll trumpet was in operation some 376 hours, and consumed about 3 tons of coal and about 88 feet of wood.

1003. *Robinson Point, Washington*.—The 12-inch steam whistle was in operation some 176 hours, and consumed about 10 tons of coal.

1030. *Turn Point, Washington*.—The Daboll trumpet was in operation some 294 hours, and consumed about 2 tons of coal.

1031. *Patos Islands, Washington*.—The Daboll trumpet was in operation some 268 hours, and consumed about 3 tons of coal.

**BUOYAGE.**

The buoyage is in excellent condition. This efficiency could not have been reached with one tender; two are absolutely necessary. In stormy and winter weather the tenders at times are bar-bound for weeks at Astoria and other ports on this coast. Every buoy in this district is in place, and, with very few exceptions, was changed twice during the year. Some of the most important ones were changed three or four times, according to the state of the various bars.

The eight whistling and four bell buoys in position are all in good condition.

**DEPOT.**

*Tongue Point, Columbia River, Oregon*.—Under the contract the wharf approach and the spar shed were completed, and the crib work and planking of the space in front of the storehouse was done by hired labor. The wharf is now complete and gives abundant space for the storage of the buoys and supplies. The keeper's dwelling, storehouses, wharf, and grounds are in good condition. A new stand is needed for the large water tank, a new boiler for the pump, and some stone filling for the crib.

**Thirteenth District.**

The coal oil stored here for use as an illuminant in the light-houses of the Thirteenth light-house district is a source of great danger to the structures of the depot and the stores they contain, as well as to the light-house tenders when tied up at the depot wharf. The oil should be transferred to two structures built for use as oil houses, and located as far as practicable from the other depot buildings, say on the beach just above high-water mark, near the north boundary line of the station, and a track should be constructed connecting them with the wharf. It is estimated that this can be done for not exceeding \$2,000, and it is recommended that an appropriation of this amount be made therefor.

**TENDERS.**

*The Manzanita.*—This wooden, screw steamer is in good order and condition. In March, 1895, she was docked at Quartermaster Harbor, near Tacoma, and the bushings of her shaft were overhauled. She was constantly employed in the buoyage of the district, landing supplies, fuel, construction material, transporting mechanics, and making inspection trips. When bar and weather bound at Astoria the crew were employed at the depot repairing, cleaning, and painting buoys, and the like. During the year she steamed some 13,832 miles and consumed about 972 tons of bituminous coal. The tender made 50 inspection trips. She changed and established 150 buoys, erected, repaired, and painted 38 day marks, and delivered annual supplies, 200 tons of coal, 60,000 feet of lumber, 69,000 brick, and about 250 tons of other freight to various light-stations.

*The Columbine.*—This steel, screw steamer was constantly employed in buoyage, landing supplies and construction material, transporting mechanics and making inspection trips. When bar and weather bound at Astoria the crew were employed at the depot cleaning, painting, and repairing buoys and other necessary work.

The tender is in good condition. During the year she steamed 14,120 miles and consumed 1,352 tons of bituminous coal. She made 61 inspection trips. She changed and established 205 buoys, erected and repaired 31 day marks, delivered annual supplies to the light and fog signal stations, and landed 196 tons of coal, also 39,369 feet of lumber and 76 tons of miscellaneous stores. On June 8 she left Seattle for Alaska with the chairman and chief clerk of the Light-House Board to inspect the buoyage in those waters. She went to latitude 59° 29', the highest ever visited by any light-house tender. She made the trip in 22 days, changed, cleaned, and painted 60 buoys and 26 day marks. At Sitka a beacon light was established, the first in Alaskan waters. The tender has not been docked since March, 1894, but was beached several times on the sands near Astoria to clean and to paint her bottom with a coat of antifouling paint.



89°

85°



## FOURTEENTH DISTRICT.

fourteenth district extends, on the Ohio River, from Pittsburg, Mo., Ill., 966 miles; on the Tennessee River, 255½ miles, and on the Kanawha, 73½ miles; in all, a distance of 1,295 miles, and all the aids to navigation within these limits.

*Commander.*—Lieut. Commander F. W. Crocker, United States Navy, March 15, 1895; since then, Lieut. Commander William W. Gill, United States Navy.

*Superintendent.*—Lieut. Col. Amos Stickney, Corps of Engineers, United States Army.

There are in this district:

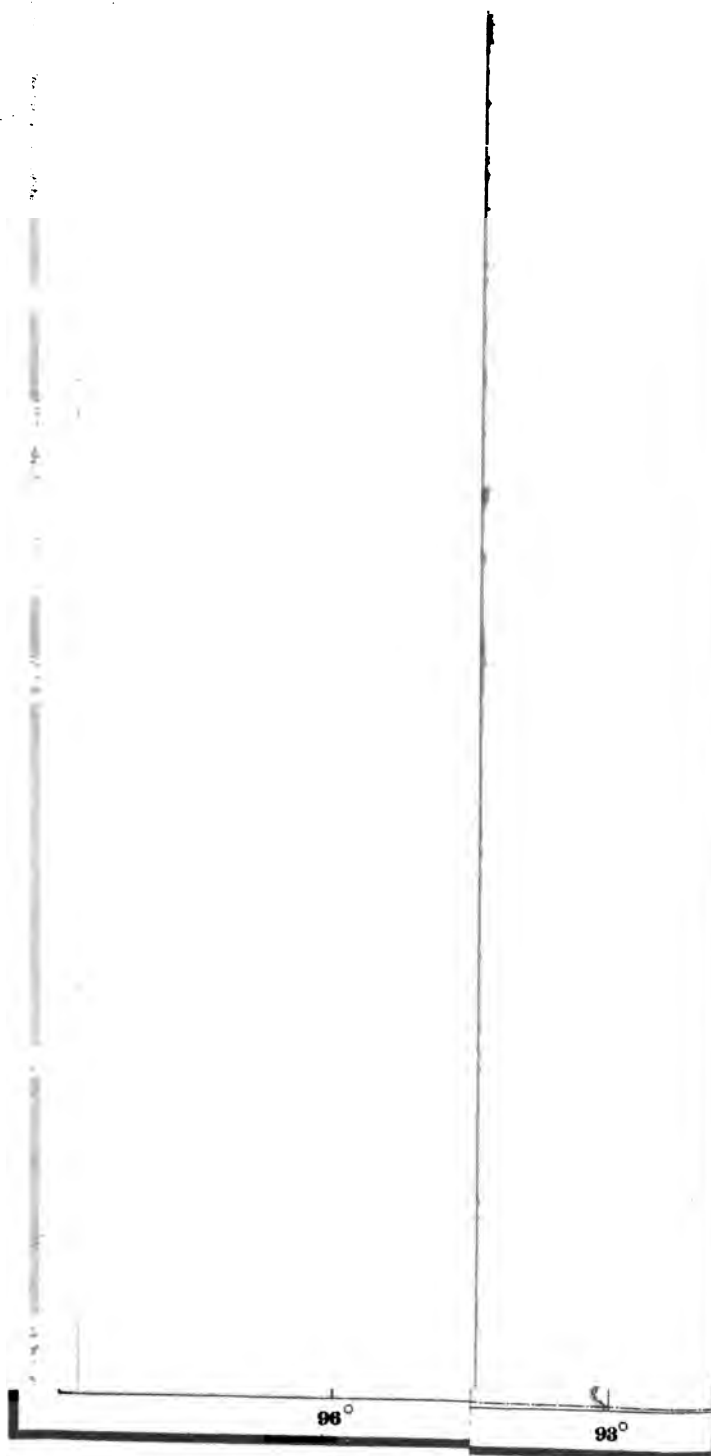
Boats	493
Day lights	35
Keepers	488
Tender <i>Goldenrod</i> , for supply and inspection	1
Number of day marks	2

During the year there were three post lights and one float light discontinued, while six new post lights were established on the Ohio River. One new day mark was established on the Tennessee River. Three supply and inspection trips were made during the year, and each station was visited on each trip, except during the last trip, when the tender was unable to go higher on the Tennessee River than Waterloo, Ala., because of low water. The two lights immediately above Waterloo were, however, supplied, while the three lights still higher had already received supplies sufficient to last them until the tender's succeeding trip. On the last trip, which ended June 22, new posts were set and repairs were made, all posts were painted, trees and brush interfering or likely to interfere with lights were cleared away, and everything was left in good order. Sufficient supplies were left with each keeper to insure the proper service of the lights through any probable continuance of low water.

Masters and pilots speak in complimentary terms of the service of the Light-House Establishment in this district, and they in turn have rendered the Light-House Establishment valuable assistance. The light keepers have, in the main, performed their duties in a satisfactory manner.

## TENDER.

*The Goldenrod.*—The hull of this steel stern-wheel steamer was repaired by contract, and, in addition, certain small repairs were made to the rudders and to the vessel's bottom. While on the marine rail-



## FIFTEENTH DISTRICT.

The Fifteenth district extends on the Mississippi River from the head of navigation to Cairo, Ill., on the Missouri River to Kansas City, Mo., and on the Illinois River from La Salle to its mouth, being in all a distance of 1,582½ miles, and embraces all the aids to navigation within these limits.

*Inspector*.—Lieut. Commander Abraham B. H. Lillie, United States Navy.

*Engineer*.—Lieut. Col. Charles R. Suter, Corps of Engineers, United States Army.

Number of lights .....	524
Number of keepers .....	332
Number of channel marks .....	74
Number of trees cut down .....	1, 141
Number of acres cleared .....	6
Number of gallons of oil used .....	14, 754
Number of lights established .....	18
Number of lights discontinued .....	17
Steamer <i>Lily</i> for supply and inspection .....	1

The district is in a state of efficiency. The number of complaints received of lights out or burning dimly has not exceeded the average of former years. In all instances explanations have been called for, and if unsatisfactory the authorized forfeiture of pay has been imposed. In the majority of cases the faulty service was due to natural and unavoidable causes rather than to the neglect of keepers. But little damage to stations by trespassers has been reported, and parts of but two outfits were lost by accidents.

## TENDER.

*The Lily*.—This wooden side-wheel steamer and her equipments, taking into account their length of service, are in good condition. In April, through the courtesy of the engineer officer in charge, she was placed in the Government dry dock at Keokuk, Iowa, to replace a couple of broken planks in the bottom, which was all that was found necessary to be done. Various minor repairs were made to the machinery. A new yawl was ordered in June to take the place of an old boat which had become unserviceable through long service and constant repairs. The color of the outside of the tender was changed from

**Fifteenth District.**

dark brown to white, making her more presentable in appearance and much cooler on board, besides making her uniform in color with the tenders in the lower river districts.

The year has been marked by an abnormally low stage of water, in consequence of which through navigation to St. Paul was suspended early in August and was not renewed until the middle of May, business in the interval being confined to raft boats and local packets. The winter was exceptionally severe, and the river below St. Louis was closed by ice the entire months of January and February, during which time the lights were extinguished. In other parts of the district the lights were stopped or started as navigation closed or opened. The *Lily* during the year steamed some 6,608 miles and consumed about 985 tons of coal.





## SIXTEENTH DISTRICT.

The Sixteenth district extends on the Mississippi River from Cairo, Ill., to New Orleans, La., and on the Red River a distance of 8 miles, being in all a distance of 1,009 miles, and embraces all the aids to navigation within these limits.

*Inspector.*—Commander Andrew J. Iverson, United States Navy.

*Engineer.*—Lieut. Col. Charles R. Suter, Corps of Engineer, United States Army.

In this district there are—

Post lights.....	359
Number of keepers.....	334
Steamer <i>Joseph Henry</i> , for supply and inspection.....	1

There are in the Sixteenth district 359 post lights, cared for by 334 keepers, an increase of 7 post lights and 3 keepers in the past twelve months. The number thus shown is not arbitrary, but varies with the stages of the river, a greater number of lights being maintained during low water than when the river is full. Thus the close of the first quarter, 1895, showed 360 post lights, with 335 keepers; that of the second quarter, 1895, showed 355 post lights, with 336 keepers; that of the third quarter, 1895, showed 364 post lights, with 331 keepers; that of the fourth quarter, 1895, showed 359 post lights, with 334 keepers. The efficiency of the district was maintained and the work of the keepers was satisfactory.

During the year complete inspections of the lights of the district were made during each quarter, as required by the regulations, in addition to which several trips were made on the launch to points within a radius of, say, 100 miles from Memphis, to adjust post lights which were put out of position by changes of channel.

During the year 1,472 post lights were visited, inspected, paid, and supplied; 42 were established, 35 were discontinued, and 264 were moved; 79 keepers were discharged and 82 were appointed. Some 1,188 trees over 4 inches in diameter were felled; 14½ acres of willows, brush, etc., were cleared; 13,173 gallons of mineral oil and 63 gross of wicks were issued to the keepers.

## TENDER.

*The Joseph Henry.*—During August, 1894, this wooden side-wheel steamer was taken to Mound City, Ill., and hauled out on the ways, when her hull was repaired. These repairs make the tender service-

**Sixteenth District.**

able for at least two years. Additional minor repairs were made during the year to the boilers and machinery. She was under steam 115 days, exclusive of 231 days that the donkey boiler was under steam. During this time she steamed some 8,128 miles, and consumed in so doing some 966 gross tons of coal. .

**CONCLUSION.**

The Board feels warranted in reporting, in conclusion, that the general efficiency of the service has been maintained throughout the year at as high a standard as was practicable with the means available.

J. G. WALKER,  
*Rear-Admiral, United States Navy,*  
*Chairman.*

GEO. F. F. WILDE,  
*Commander, United States Navy,*  
*Naval Secretary.*

JOHN MILLIS,  
*Captain, Corps of Engineers, United States Army,*  
*Engineer Secretary.*

The SECRETARY OF THE TREASURY.



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